SANS DIGITAL®

TOWERRAID TR8M-B | TR8M

DETAILED USER'S MANUAL v1.0

Table of Contents

Chapter 1 - Overview

SANS DIGITAL TR8M-B/TR8M enhances your data storage by combining advanced RAID[1] features typically seen on high-end data systems with high capacity Serial ATA (SATA) drives. By using industry standard SATA drives and Silicon Image Host Bus Adapters, you can achieve extraordinarily performance while remaining assured that your data is protected against hardware failure.

1.1 PRECAUTION

Please read the safe precautions carefully before you using SANS DIGITAL TR8M-B/TR8M storage appliance. Ensure that you use the product correctly according to the procedure described in this guide.
The following safety precautions are intended to remind you to operate the product safely and correctly. Please read and ensure that you understand them before you proceed to the other sections of this guide.

- Do not attempt to disassemble or alter any part of the product that is not describe in this guide.
- Do not allow the product to come into contact with water or other liquids. In the event that water or other liquids enter the interior, immediately unplug the product from the computer. Continued use of the product may result in fire or electrical shock.
- Do not handle the product near a heat source or expose them to direct flame or heat.
- Never place the product in close to equipment generating storage electromagnetic fields. Exposure to strong magnetic fields may cause malfunctions or corrupt data.
- TR8M-B/TR8M does not support Windows 3.x/ 95 / 98SE/ ME/ NT.
- Before the unit operating, Hard disk drive needs to be installed.

1.2 FEATURES

1.2.1 Data Security

The SANS DIGITAL TR8M-B/TR8M software utility includes monitoring software for possible defective hard drive:

- RAID 1, 10 and 5 is supported with the use of the software. RAID levels 1, 10, and 5 will prevent data loss, even when one of the hard drives in the RAID is defective.
- Supports hot-spare so that risk can be minimized by automatically regenerating the failed disk's data on a backup disk.
- Support for Self-Monitoring Analysis and Reporting Technology (S.M.A.R.T.[2]) to check disk physical status.
- Drives can be moved between controllers without losing data.

1.2.2 Data Versatility

The SANS DIGITAL TR8M-B/TR8M software utility support Contiguous (Just a Bunch of Disk, JBOD mode) and Concatenated (Spanning mode) drives for applications which do not require security or performance.

1.3 EASE OF USE

The SANS DIGITAL TR8M-B/TR8M utility offers an easy to use interface for creating and managing your storage:

- Support SATA-II Port Multiplier support
- Support 3Gbit/sec transfer rate
- Creating and deleting volumes is possible without restart of the operating system
- Auto-Rebuilds supported so that it does not require the data to be taken off-line.

1.4 SPECIFICATIONS

- A single eSATA host port to 8 SATA 3.5-inch hard disks.
- Power and host status LED, and devices status and activity LED.
- Metal chassis (SECC) and plastic panel frame (ABS) design.
- 6 (W) x 13.5 (H) x 13.5 (D) Inches, NW: 6.0 lbs, GW: 6.8lbs.
- Design based on the Silicon Image SiI3726 Port-Multiplier with SiI3132R5 PCI-Express HBA.
- Support Striped (RAID 0), Mirrored (RAID 1), Mirrored Striped (RAID 10), Parity RAID (RAID 5) modes, and hot spare on Mirrored (RAID 1) and Parity RAID (RAID 5) modes.
- Support Contiguous (Single Drive, JBOD) & Concatenation (Combined Drives, Spanning) modes.

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[1] Redundant Array of Independent Devices, a method of combining drives to provide better protection and/or performance.

[2] Self Monitoring, Analysis and Reporting Testing.

- 300 watts, 100 & 240 Vac / 50~60Hz with FCC, CE requirement.

1.5 SUPPORTED OPERATING SYSTEMS

The following operating systems are supported by the SANS DIGITAL TR8M-B/TR8M software driver and utility.

- Windows 2000
- Windows XP, 32/64-bit
- Windows Server 2003, 32/64-bit
- Windows Vista, 32/64-bit

The following operating systems are supported by the SANS DIGITAL TR8M-B/TR8M with driver. Hard Drive can be use as individually using JBOD mode:

- MAC OS X
- Linux 64-bit and 32-bit ((Fedora Core 2, Fedora Core 3, Fedora Core 4, Red Hat Enterprise Linux 4.0 (RHEL 4.0), RHEL 4.0 update 1, RHEL 4.0 update 2, RHEL 4.0 update 3, SuSE Enterprise 9.0, SuSE Enterprise 9.0 SP2, SuSE Enterprise 9.0 SP3, SuSE Pro 9.3)

1.6 PRODUCT CONTENTS

The following parts are content.

- TR8M-B/TR8M Unit
- PCI-Express 1X eSATA HBA
- eSATA Cable
- AC Cable
- Tool-less Screw x 8
- User Manual and Utilities CD

Chapter 2 - AN INTRODUCTION TO RAID

2.1 RAID VOLUMES

RAID technology allows one or more disks to be combined into a logical volume which provides greater performance and/or protection than standard single disk drives. These volumes, also known as RAID Groups, appear like regular disk drives to the operating system and can be partitioned, formatted and used just like any other normal disk. The creation and necessaries calculation of the RAID is hidden from the operating system.

There are several different methods of combining disks. Each method is referred to as a RAID "level" such as RAID Level 1, or RAID 1. The details of each level are summarized below and detailed in the following sections.

RAID LEVEL	CONFIGURED AS	ADVANTAGES	DISADVANTAGES
0	Striped	Excellent performance All of the Hard Drive disk space is available to use	No data protection
1	Mirrored	Excellent data protection	Space available is divided by half
10	Mirrored Striped	High performance Excellent data protection	Space available is divided by half. Required 4 disk or more
5	Parity RAID	Good data protection, Good Proformance	Some performance degradation for writes. Space avalible is total number of hard drive space minus one hard drive space Required 3 disk or more
Combination	Concatenated	Good performance All of the Hard Drive disk space is available to use	No data protection
Single Drive / Segment	Contiguous	Same as single disk	Same as single disk

2.2 SEGMENTING DISKS

For increased versatility, the TR8M-B/TR8M utitly, SATARAID5 software, allows individual disks to be divided into smaller segments which can then be combined into different volumes. As an example, if a user has one set of data that must be protected at all costs, another set of data which should be protected at reasonable cost and another set that doesn't need any protection at all; the user can divide three disks into sections as shown in Figure 1. The yellow regions define the high security volume, the green section is the middle security volume and the light blue shows the unprotected area.

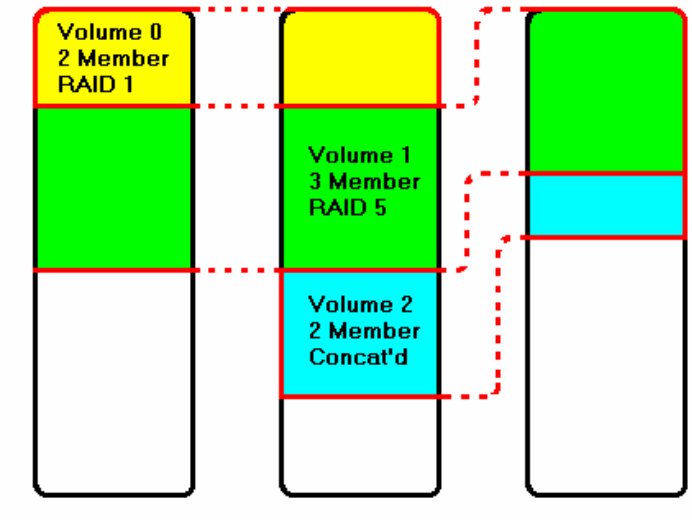
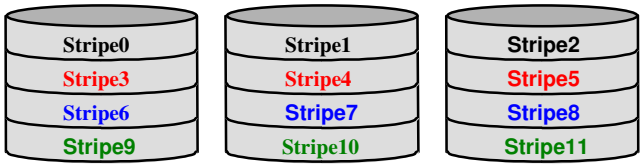


Figure 1: Dividing Disks into Members

2.3 RAID LEVELS IN DETAILS

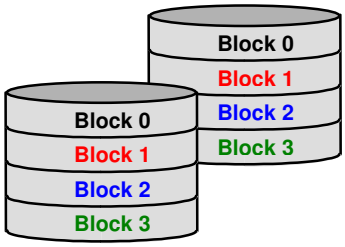
2.3.1 Disk Striping (RAID 0)

Striping is a performance-oriented, non-redundant data mapping technique. While Striping is discussed as a RAID Group type, it is does not provide any fault tolerance. With modern SATA and ATA bus mastering technology, multiple I/O operations can be performed in parallel, enhancing data throughput. Striping arrays use multiple disks to form a larger virtual disk. The figure below illustrates a three-disk stripe set. Stripe one is written to disk one, stripe two to disk two, and so forth. RAID 0 sets can be comprised of two, three, or four drives. If the sizes of the disk segments are different, the smallest disk segment will limit the overall size of the RAID Group.



2.3.2 Disk Mirroring (RAID 1)

Disk mirroring creates an identical twin for a selected disk by having the data simultaneously written to two disks. This redundancy provides instantaneous protection from a single disk failure. If a read failure occurs on one drive, the system reads the data from the other drive. RAID 1 sets are comprised of two drives, and a third drive can be allocated as a spare in case one of the drives in the set fails. If the sizes of the disk segments are different, the smallest disk segment will limit the overall size of the RAID Group.



2.3.3 Disk Mirroring and Striping (RAID 10)

RAID 10 combines the features of both RAID 0 and RAID 1. Performance is provided through the use of Striping (RAID 0), while adding the fault tolerance of Mirroring (RAID 1). The implementation of RAID 10 requires four drives. The drives are assigned as two sets of striped pairs.

The data is written to RAID Group A, which is mirrored (RAID 1) and provides data redundancy. Alternating blocks of data are then striped across another RAID 1 mirrored set, shown as Set B in the figure above. This provides improved speed. Under certain circumstances, a RAID 10 set can sustain multiple simultaneous drive failures. For example, Group A and Group B can allow one Hard Drive in their respective group to be fail simultaneously.

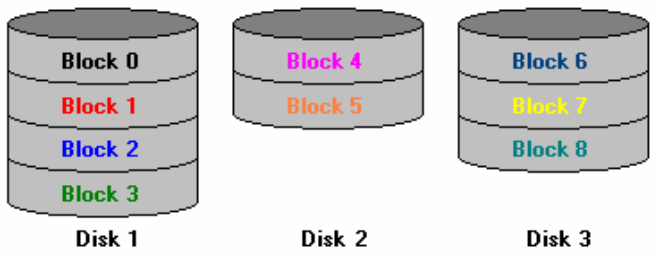
2.3.4 Parity RAID (RAID 5)

Parity or RAID 5 adds fault tolerance to Disk Striping by including parity information with the data. Parity RAID dedicates the equivalent of one disk for storing parity stripes. The data and parity information is arranged on the disk array so that parity is written to different disks. There are at least 3 members to a Parity RAID set. The following example illustrates how the parity is rotated from disk to disk:

Parity RAID uses less capacity for protection compare to RAID 1 and RAID 10 and is the preferred method to reduce the cost per Gigabyte for larger installations. Mirroring requires half of the capacity to protect the data whereas the above example using three hard drives only requires a one-third of the capacity. The additional required capacity decreases as the number of disks in the group increases (i.e., one-forth for four drives or one-fifth for five drives).
In exchange for protection, Parity RAID degrades performance for write operations. The write performance is slower compare to RAID 0 is due to each write performed need to calculate the parity. However read performance will be increase using Stripping Method.

2.3.5 Concatenation (Spanning)

The Concatenated mode combines multiple disks or segments of disks into a single large volume. It does not provide any data protection or performance improvement but can be useful for utilizing leftover space on disks. Concatenation allows the segments that make up the volume to be of different sizes.



2.3.6 Contiguous (JBOD/Single Drive/Segment)

The single drive is a virtual disk that can either be an entire disk drive or a segment of a single disk drive. Single drive is the "Contiguous" configuration option when creating RAID Groups (or sets) in the SATARAID5 software.

2.4 RAID VOLUME STATUS

A RAID volume can be in any one of the following statuses.

STATUS	MEANING
Good	All disks are currently functioning as normal.
Reduced	For RAID levels that provide data protection, one or more disks have failed but the data is still available via the RAID protection. The failed disk should be replaced as soon as possible to avoid loss of data.
Rebuilding	A failed disk drive has been replaced and the data is being regenerated on the replacement disk. When complete, the RAID Group will return to Good status.
Resynchronizing	An error has occurred and the RAID level is being regenerated. When complete, the RAID Group will return to Good status.
Failed	One or more disks have failed and RAID cannot regenerate the data. The minimum number of failures required to reach this state depends on the RAID level: ● RAID 0, Concatenated, Contiguous: Single disk failure. ● RAID 1, 10, and 5: Two disk failure.

Chapter 3 - INSTALLATION

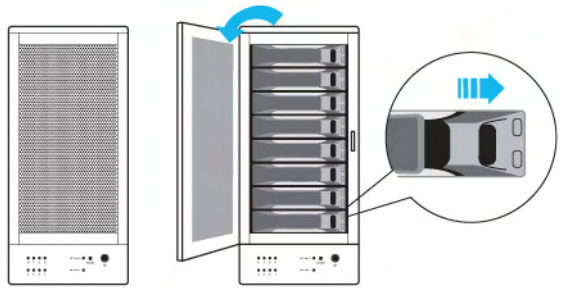
3.1 OVERVIEW

There are three separate steps that to install SANS DIGITAL TR8M-B/TR8M completely in Microsoft Windows Environments. You will need to install the Hard Drive to the TR8M-B/TR8M, eSATA Host Bus Adapter (HBA) hardware and Driver, and SATARAID5 Utility.

3.2 HARD DRIVE INSTALLATION

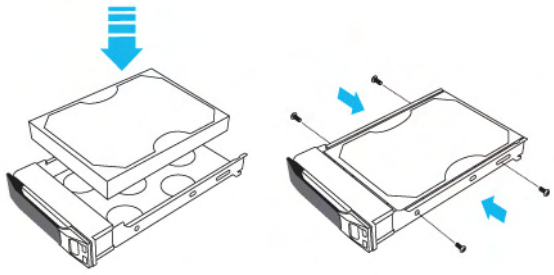
Please refer below procedure to complete the HDD installation:

1. Open the front hard drive panel of the unit.



2. Remove the hard drive trays by pushing the silver tray tab to the right and releasing the tray handle.

3. Install each hard drive by placing them into the hard drive trays and securing them on both sides with the included screws.

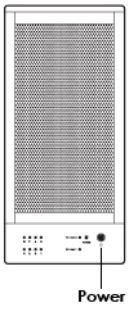


4. Place the trays back into the unit and lock them in place by pushing the tray handles in.

5. Close the front hard drive panel.

3.3 POWER ON / OFF

- Power ON: Push the power switch located in the front to switch on the power.
- Power OFF: Push and hold power switch more than 3 secends to switch off the power.



3.4 INSTALLING eSATA HOST BUS ADAPTER HARDWARE

Follow the instruction below for eSATA HBA installation:

1. Turn off your host computer.
2. Install the eSATA HBA into a PCI-Express slot (1X ~ 16X)
3. Connect one end of the eSATA cable to the eSATA connector on the eSATA HBA.
4. Connect the other end to the eSATA connecter on SANS DIGITAL TR8M-B/TR8M.
5. If hard disk drives are not installed in SANS DIGITAL TR8M-B/TR8M, insert the drives into bay 1 to 4 in order, counting from the bottom to top. Gently push the drive until the drive is fully inserted, and twist the tool-less screw seat the drive securely.
6. Switch the VAC to the correct position (For example, 115 for Japan, and 230 for UK), and attach one end of the AC power cord to SANS DIGITAL TR8M-B/TR8M and the other end to the proper AC outlet.
7. Turn on SANS DIGITAL TR8M-B/TR8M, and then turn on the host computer.

3.5 INSTALLING IN MICROSOFT WINDOWS 2000

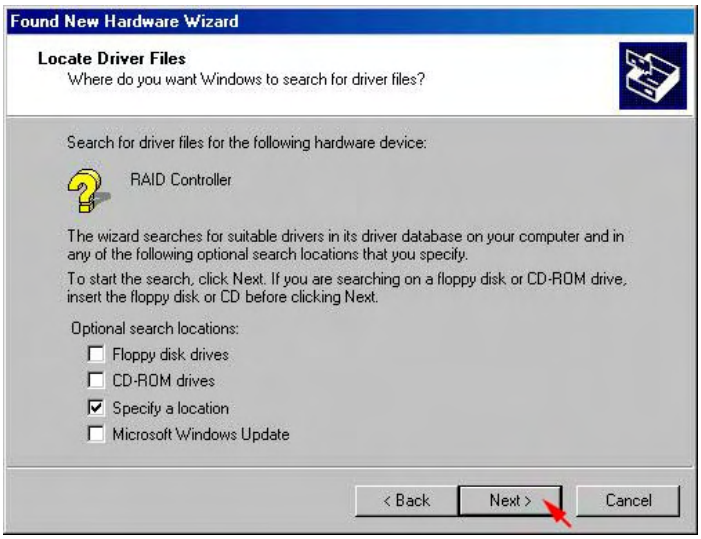
3.5.1 Installing eSATA Host Bus Adapter

Follow the instruction below for eSATA HBA Driver installation:

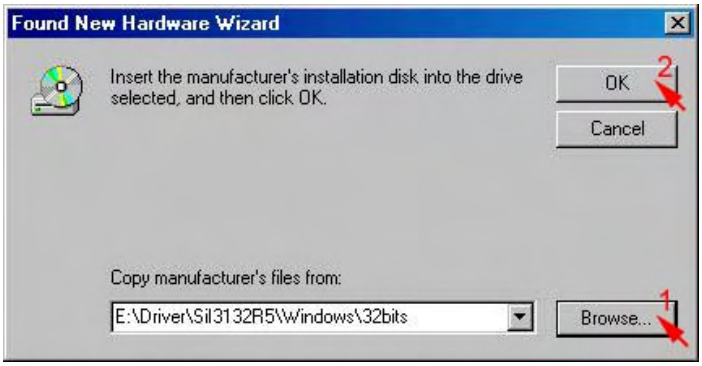
1. Insert the Manual and Utilties CD in the CD-ROM drive.
2. When start the Windows, a new hardware will be found, click **Next>**.

3. Select **Search for a suitable driver for my device (recommended)**, than click **Next>**.

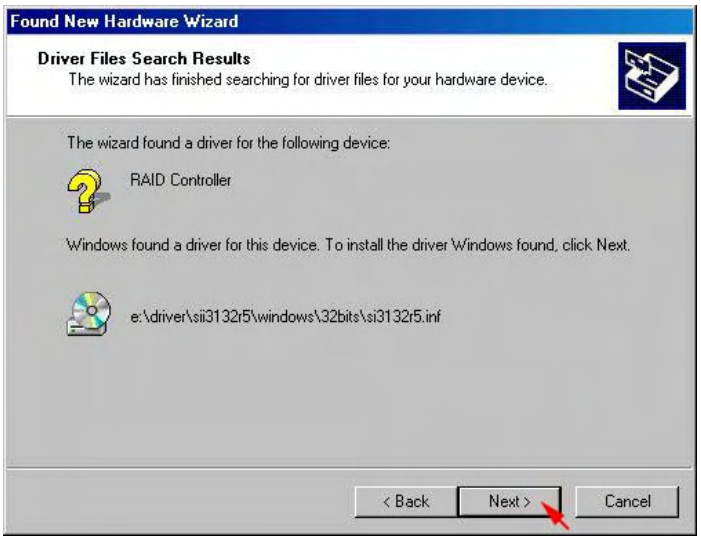
4. Select **Specify a location**, than click **Next>**.



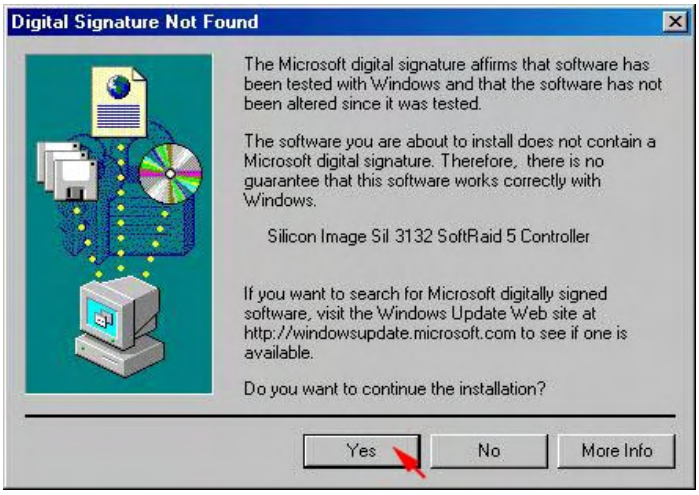
5. Click **Browse…** to select to driver path, than click **OK**.



6. Click **Next>** to install the **Silicon Image Sil3132 SoftRaid 5 Controller** driver.



7. Click **Yes** to pass the Microsoft digital signature and continue the installation.

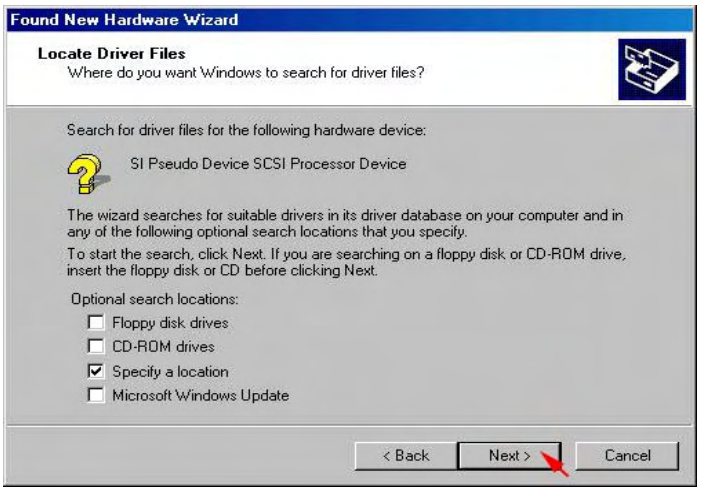


8. When the **Silicon Image Sil3132 SoftRaid 5 Controller** installation has completed, click **Finish**, and begin to the **Silicon Image's Pseudo Processor Device** driver installation.

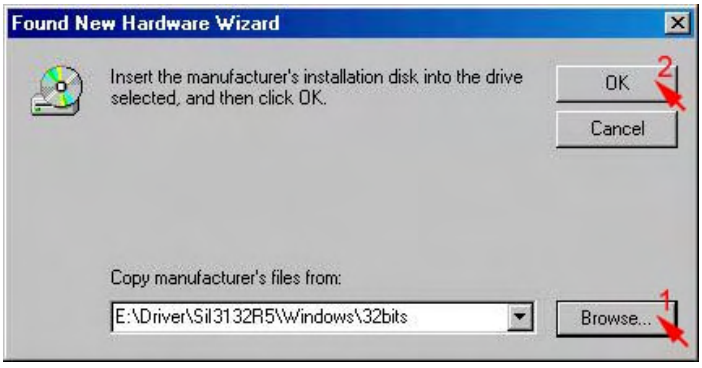
9. Windows will find the **Silicon Image's Pseudo Processor Device** hardware, click **Next>**.

10. Select **Search for a suitable driver for my device (recommended)**, than click **Next>**.

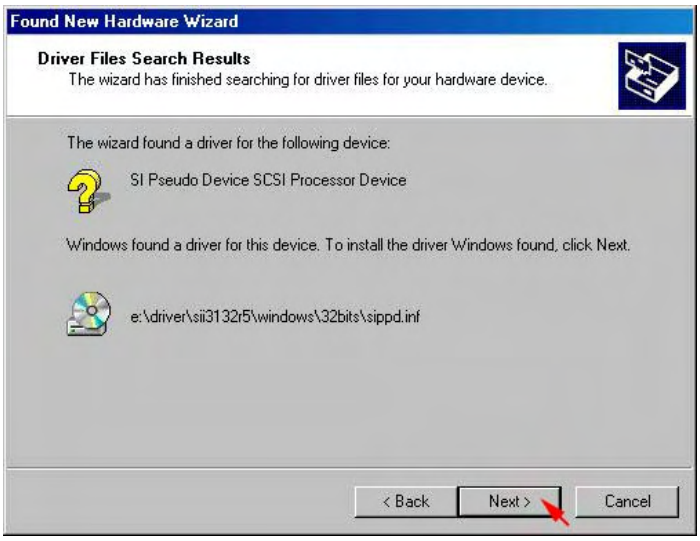
11. Select **Specify a location**, than click **Next>**.



12. Click **Browse…** to select to driver path, than click **OK**.



13. Click **Next>** to install the **Silicon Image's Pseudo Processor Device** driver.

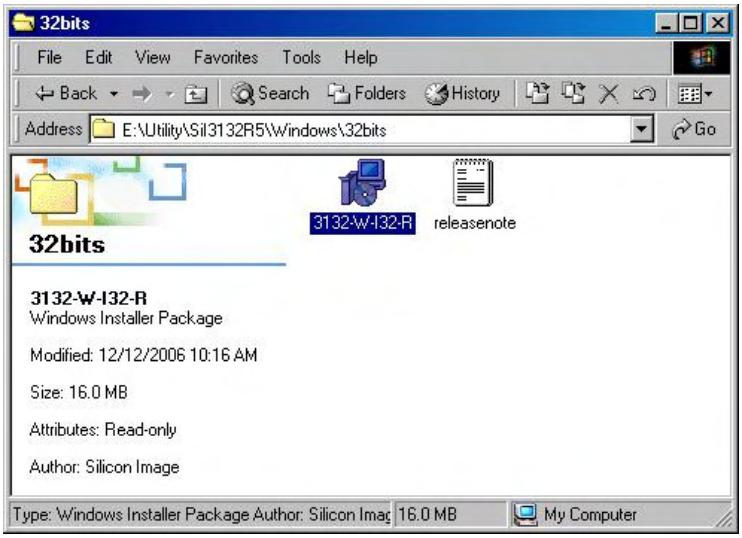


14. When the **Silicon Image's Pseudo Processor Device** installation has completed, click **Finish**.

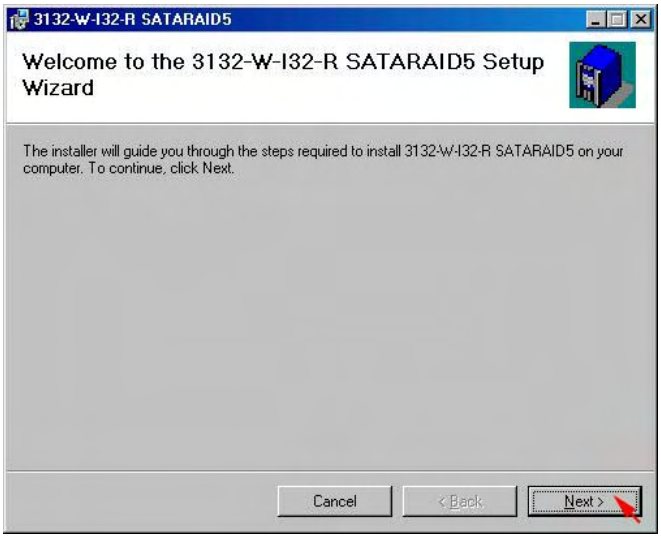
3.5.2 Installing SATARAID5 Utility

Follow the instructions below for the SATARAID5 utility:

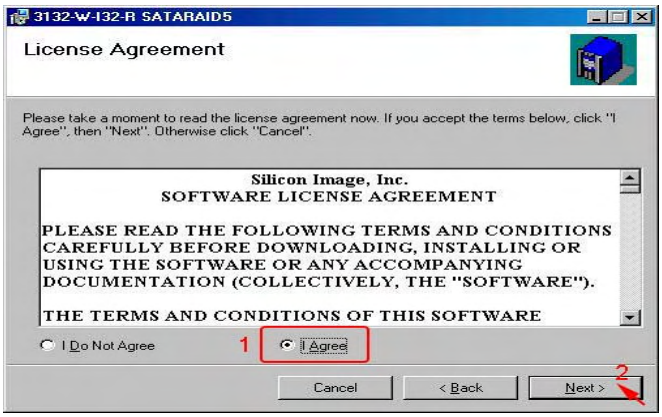
1. Open the Manual and Utilities CD and select the SATARAID5 Array Manager software from the Utility folder.
2. Double-click the **3132-W-I32-R.exe** file.



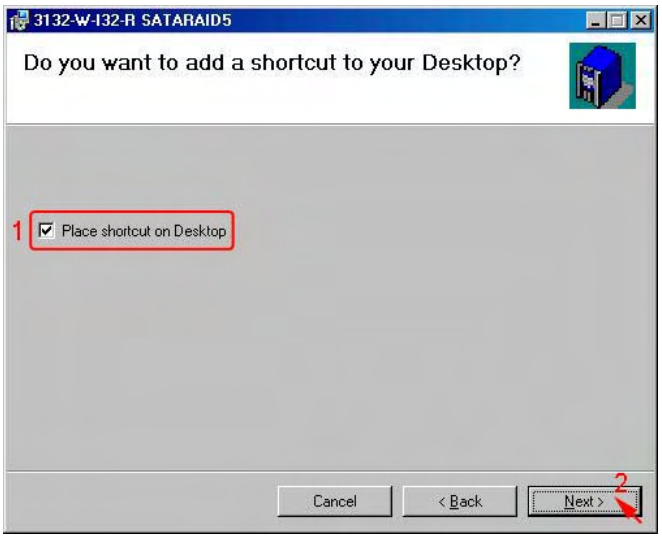
3. Click **Next>** to begin setup.



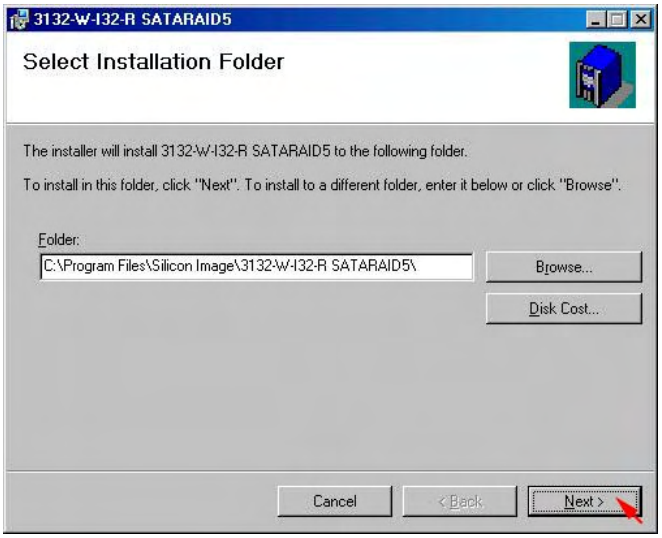
4. Select **I Agree**, than click **Next>**.



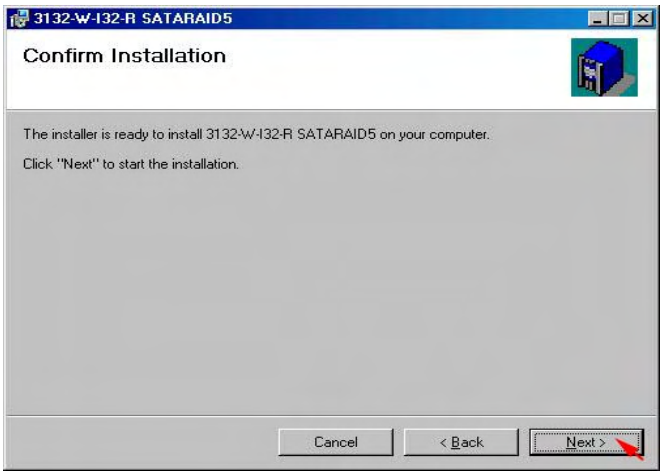
5. Select **Place shortcut on Desktop**, than click **Next>** to create a shortcut on the desktop.



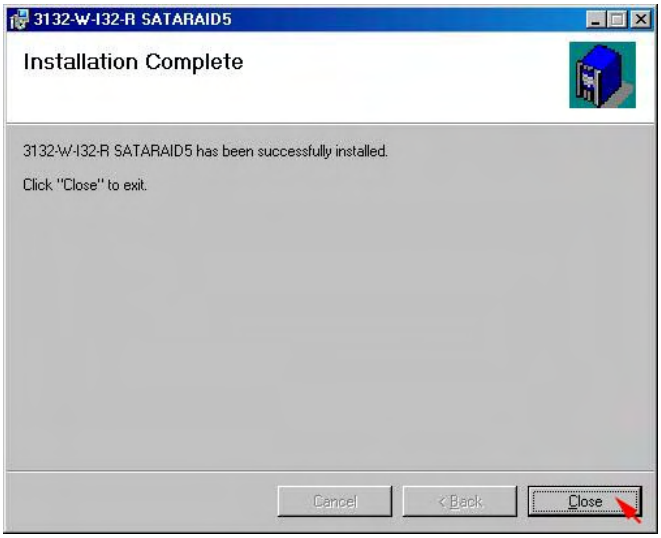
6. Click **Next>** to use the default installation folder.



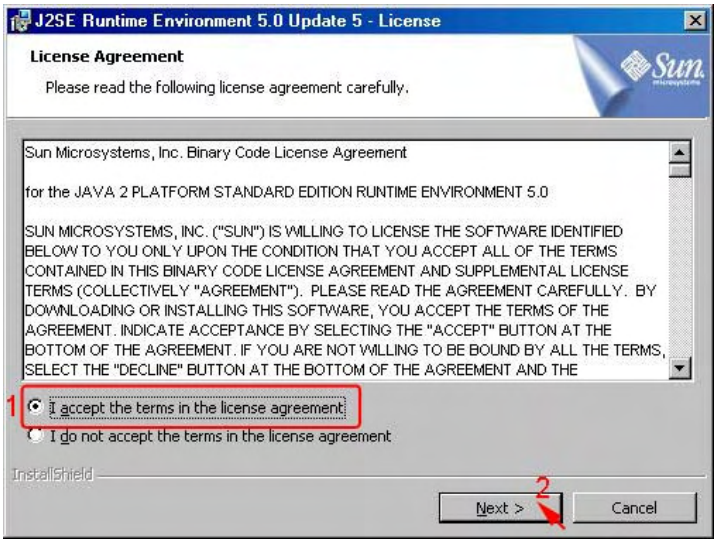
7. Click **Next>** to begin the installation.



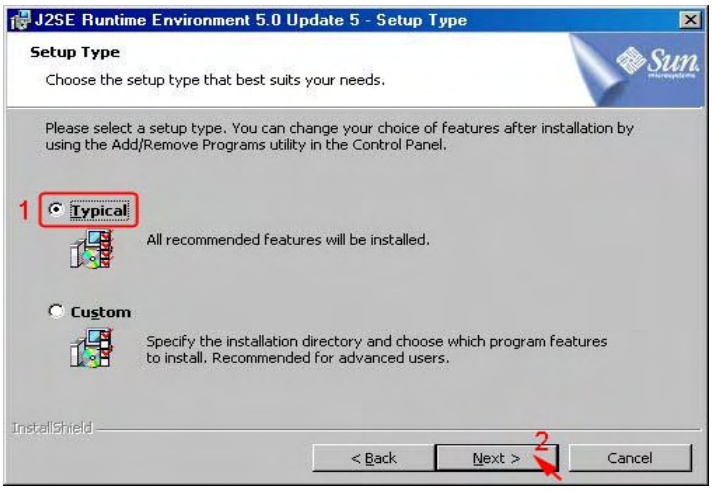
8. When SATARAID5 installation has completed, click **Close** to exit.



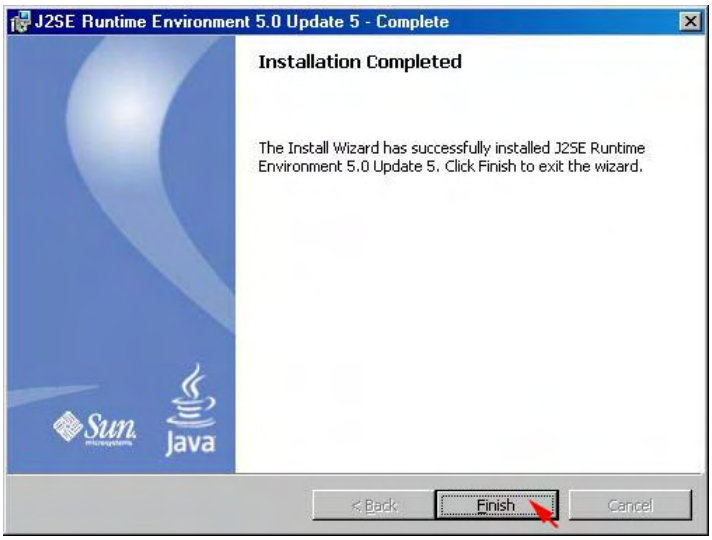
9. Select **I agree the terms in the license agreement**, click **Next>** to begin the Java platform installation. (Jave Runtime is installed previously, you may skip to number 12.)



10. Select **Typical**, than click **Next>**.



11. When Java platform installation has completed, click **Finish** to exit.



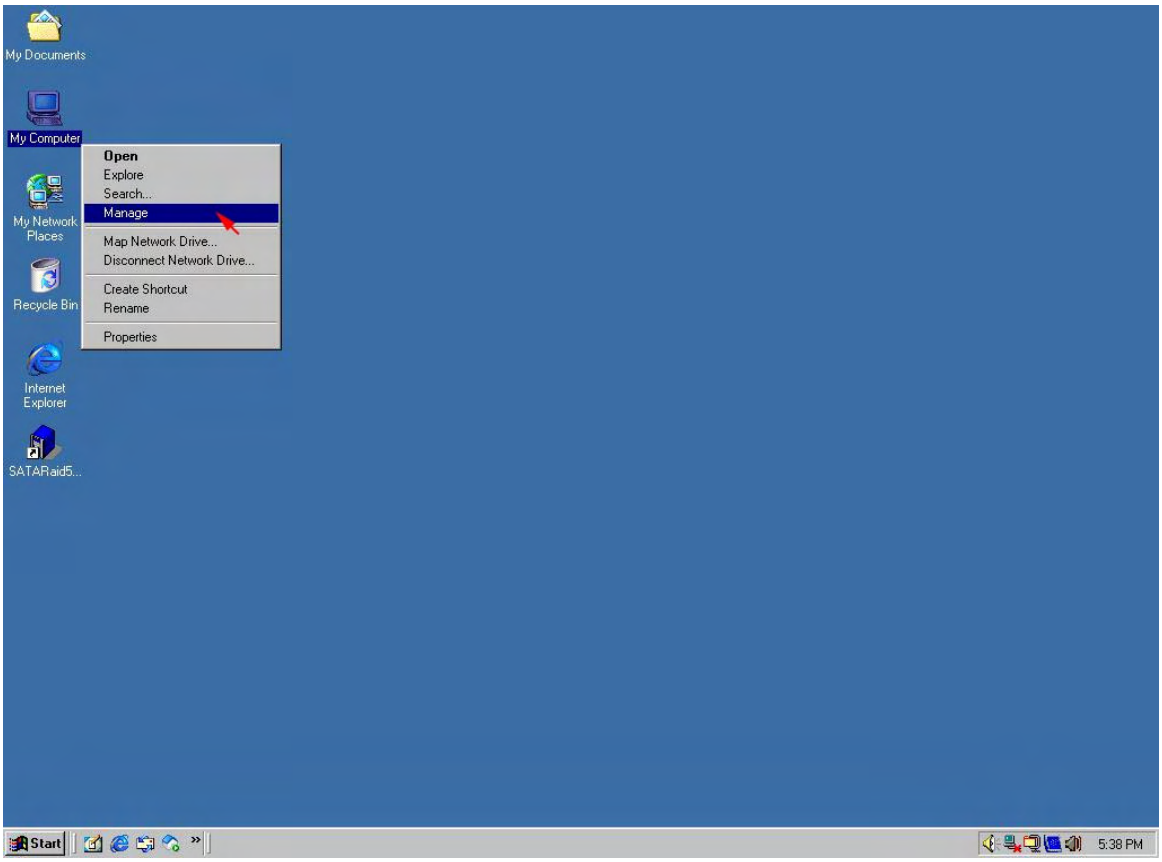
12. Select **Start** > **Programs** > **Silicon Image** > **SATARaid5Manager** to start the Array Manager software.

3.5.3 Disk Drive Mode Setup

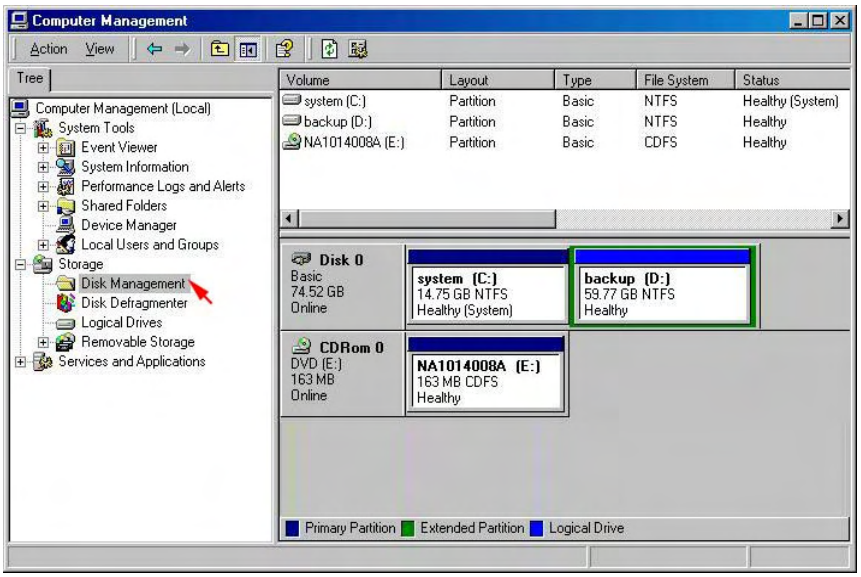
Disk Drive Mode setup will create the usable RAID partition to the computer. It is necessary to create the RAID before the allocating partition. Please refer to the chapter 4 for more detail.

3.5.4 Allocating Partition

1. Before creating any partitions, RAID groups must first be created using the SATARaid5 Manager utility (see Chapter 4).
2. Right-click on **My Computer** icon and select **Manage** from the pop-up menu.

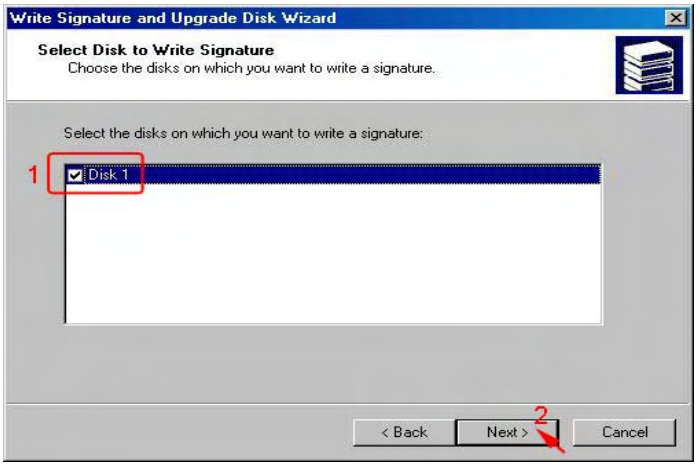


3. Select **Disk Management** under **Storage** to view the disk drives.

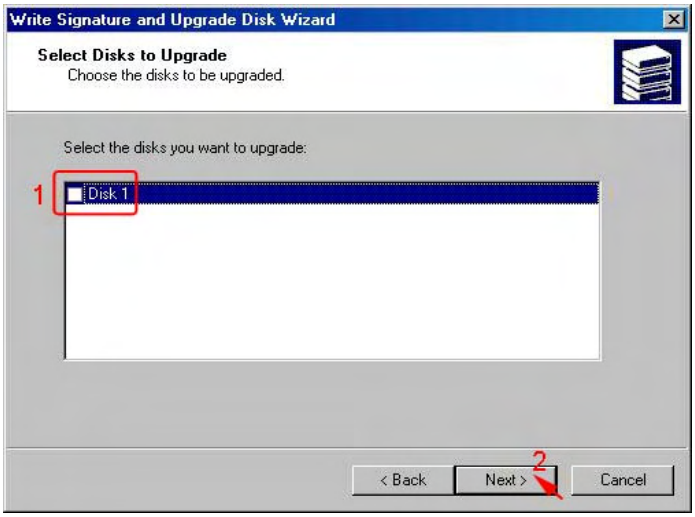


4. When **Write Signature and Upgrade Disk Wizard** appears, click **Next>**.

5. Select the new disk to write a signature, than click **Next>**.

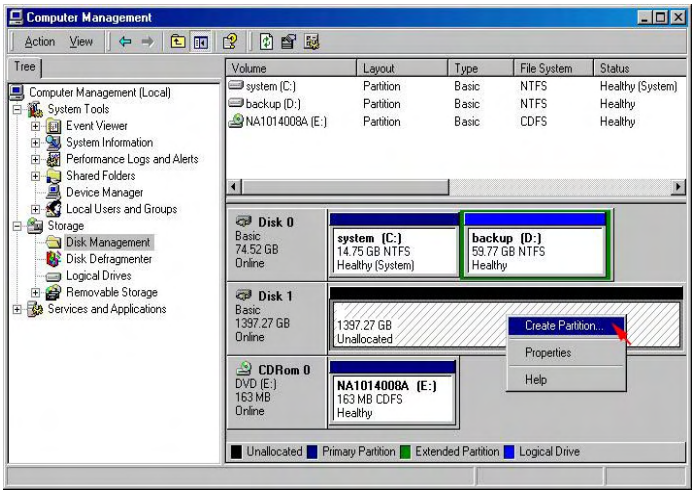


6. Do not click any disk to upgrade to dynamic disk, than click **Next>**.

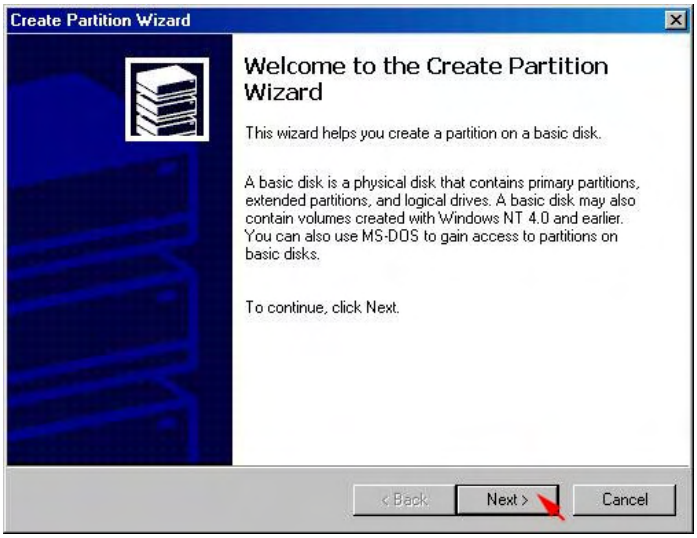


7. When the **Write Signature and Upgrade Disk Wizard** has completed, click **Finish**.
8.

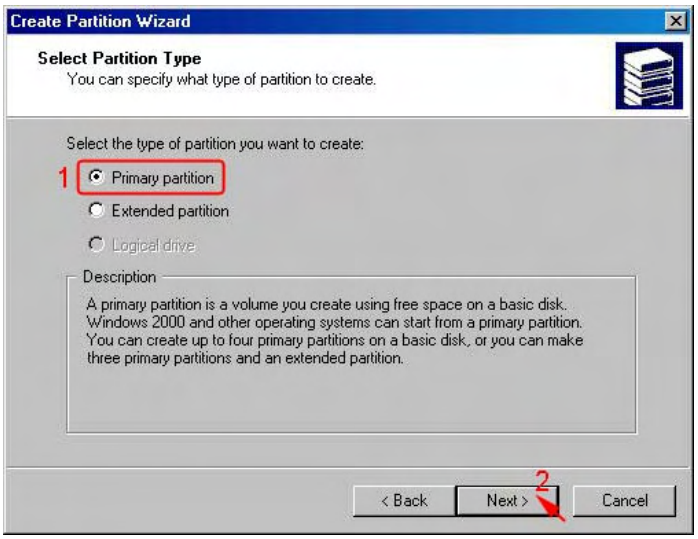
9. Right-click on the **Unallocated** partition and select **Create Partition…** from the pop-up menu.



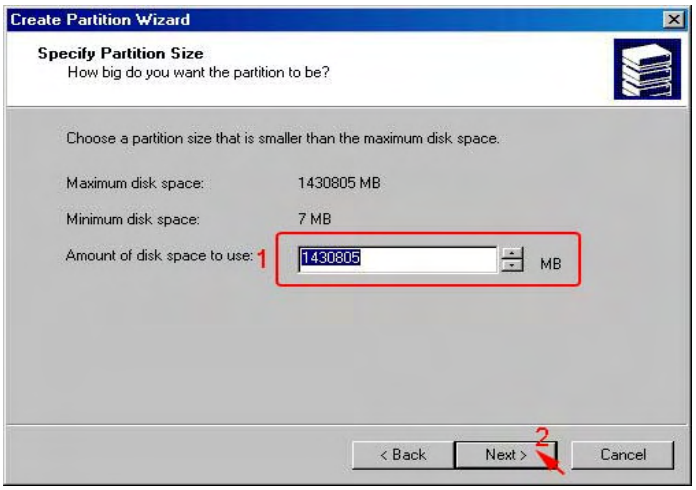
10. Click **Next>** to create a partition on a basic disk.



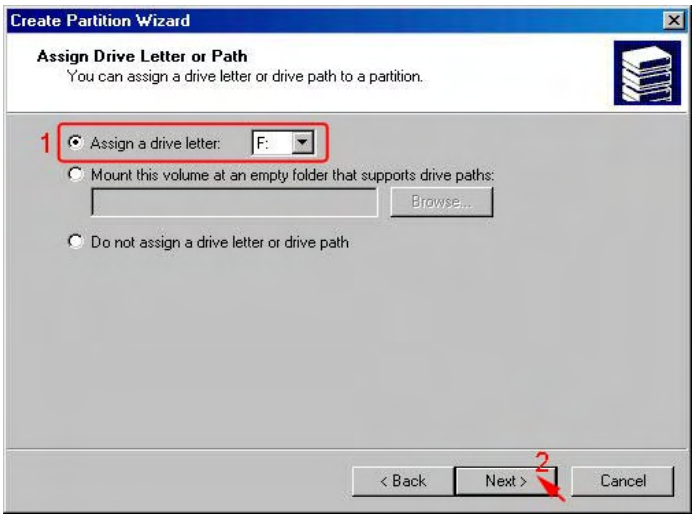
11. Select the partition type you want to create, click **Next>**.



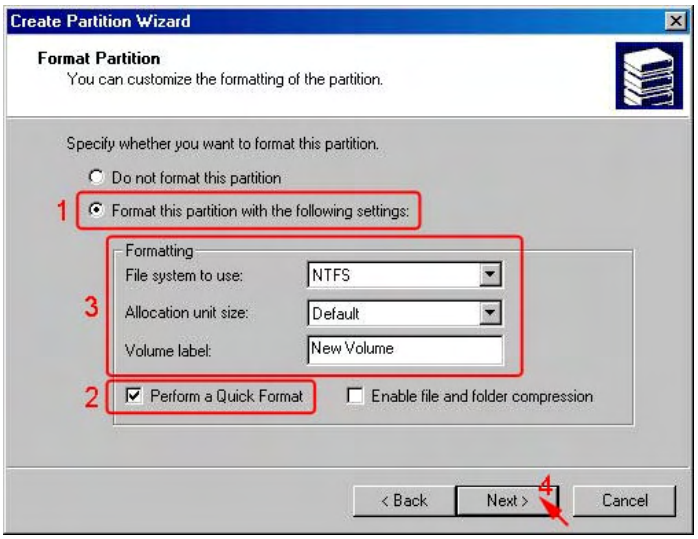
12. Specify the partition size you want to create, click **Next>**.



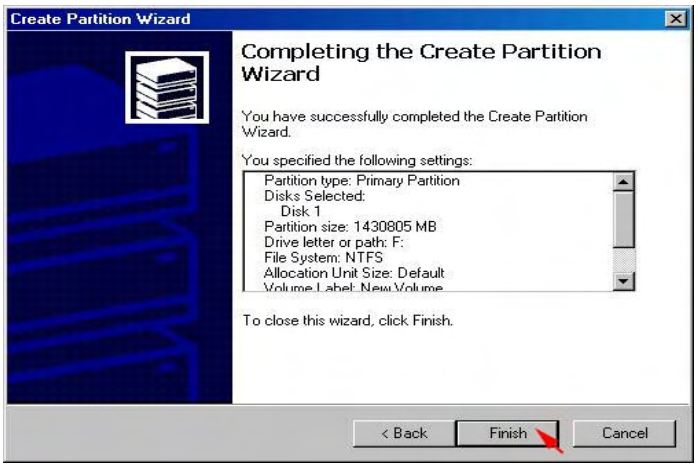
13. Assign the drive letter or path you want to create, click **Next>**.



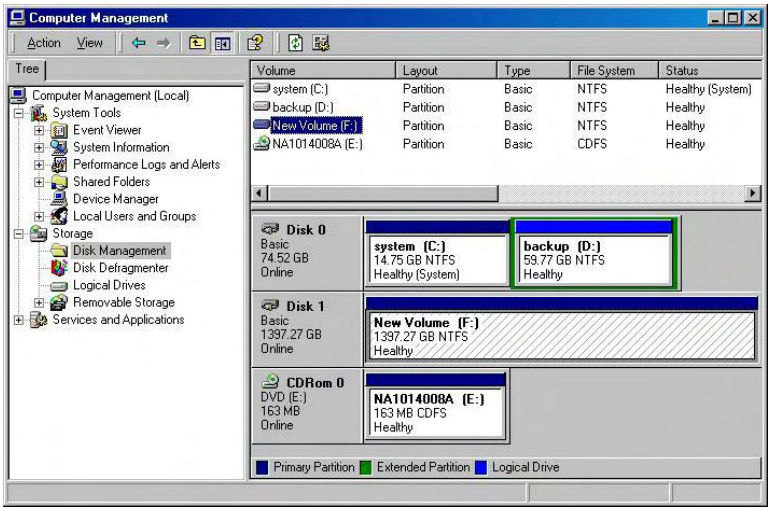
14. Click **Format this partition with the following settings** and **Perform a Quick Format**, setup the **File system to use**, **Allocation unit size**, **Volume label**, click **Next>**.



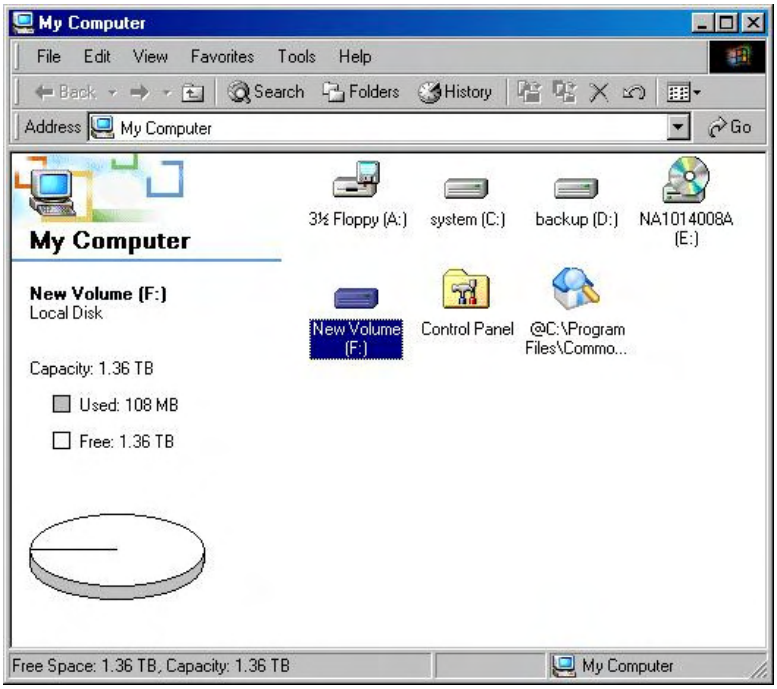
15. When the **Create Partition Wizard** has completed, click **Finish**.



The status of the created partition in the Disk Management window will change to "**Formatting".** The percentage complete will be displayed. Depending upon the size of the partition, the format process may take several minutes. When completed, the status will change to **"Healthy"** and the name and drive letter will be updated. Once the disk reports Healthy, it appears to the computer and ready to use.



Repeat the above procedure if there are any other partitions. Close the Data Management window by clicking on the small boxed "X" in the top right corner of the window. Click on the "My Computer" icon on the Desktop. The new drives will be display and properly named. The new disks are now available for use.



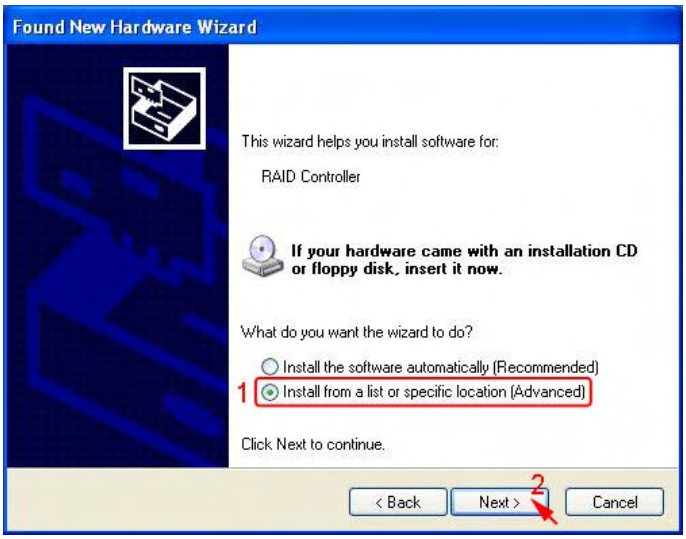
3.6 INSTALLING ON WINDOWS XP (32/64-BIT)

3.6.1 Installing eSATA Host Bus Adapter

Follow the instruction below for eSATA HBA Driver installation:

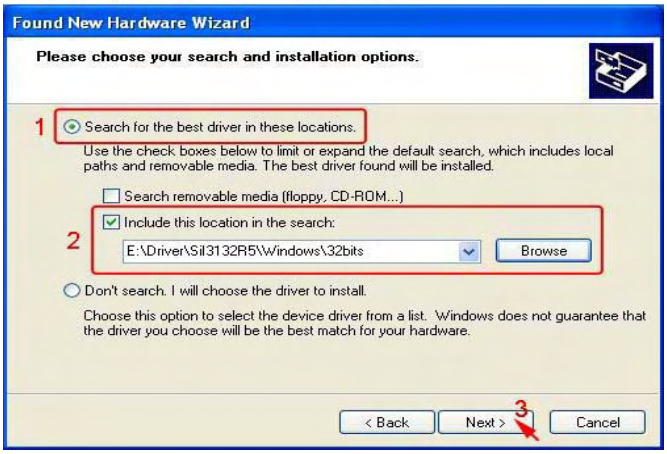
1. Insert the Manual and Utilties CD in the CD-ROM drive.
2. When start the Windows, new hardware will be found; Select **No, not this time**, than click **Next>**.

3. Select **Install from a list or specific location (Advanced)**, than click **Next>**.

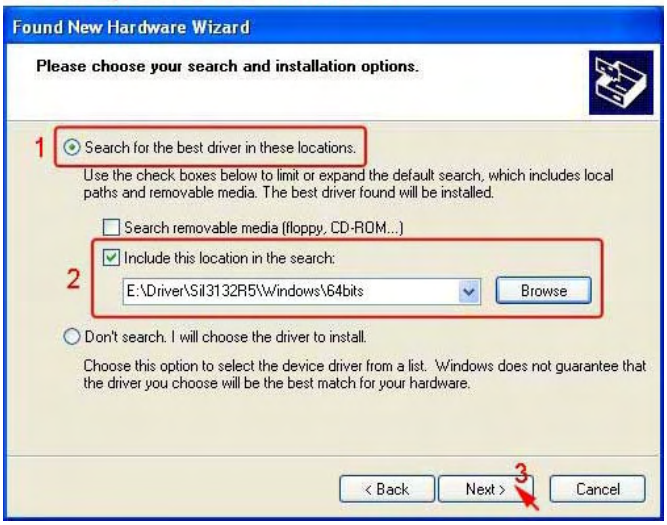


4. Select **Search for the best driver in there location**, **Include this location in the search**, and click **Browse** to select the driver path, than click **Next>**.

Driver path for Windows 32-bit:



Driver path for Windows 64-bit:



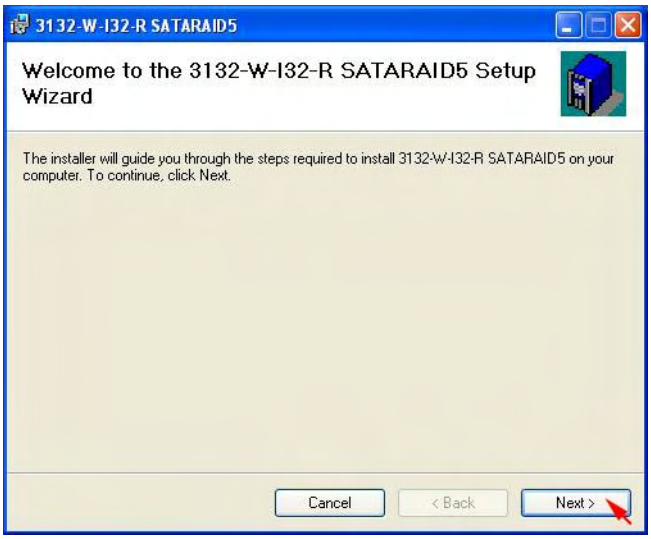
5. When the installation has completed, click **Finish**.

3.6.2 Installing SATARAID5 Utility

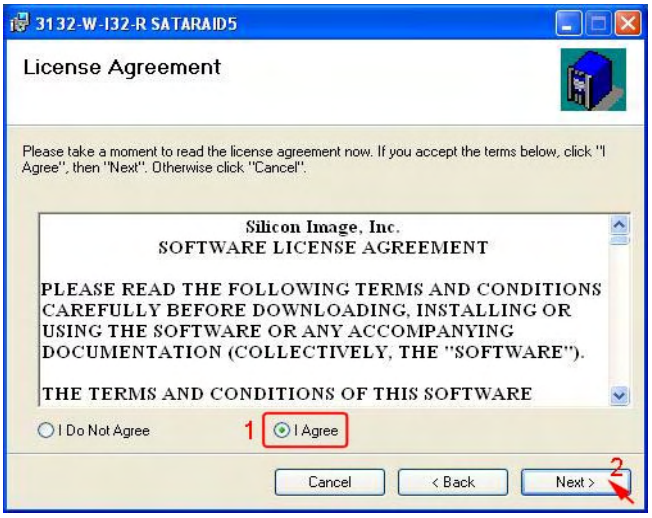
Follow the instructions below for the SATARAID5 utility:

1. Open the Open the Manual and Utilities CD and select the SATARAID5 Array Manager software from the Utility folder.

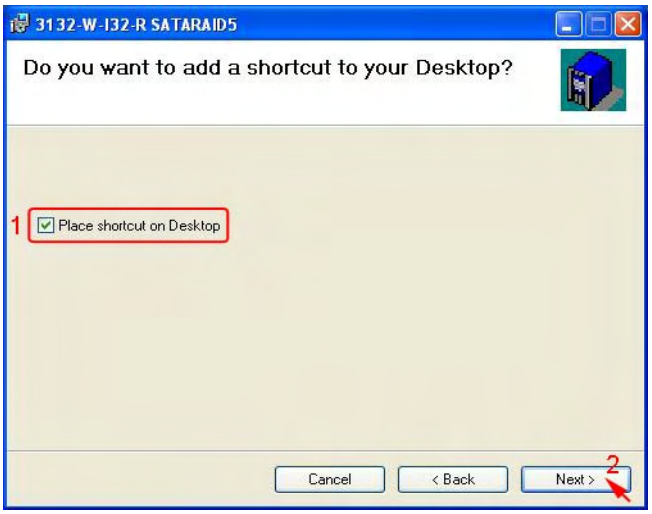
2. Click **Next>** to begin setup.



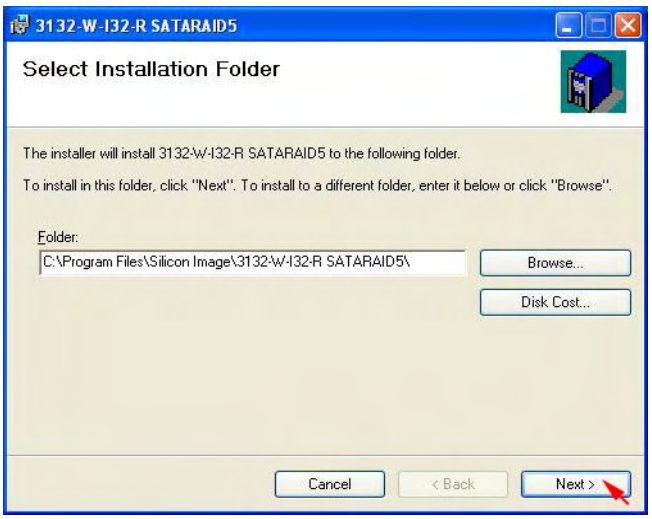
3. Select **I Agree**, click **Next>**.



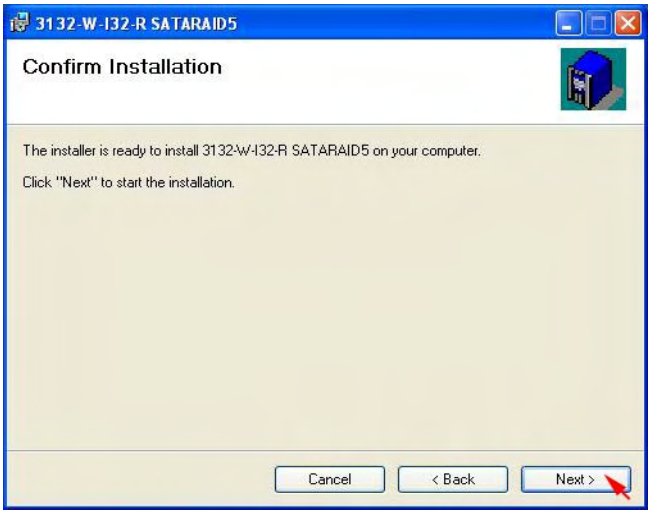
4. Select **Place shortcut on Desktop**, click **Next>** to create a shortcut on the desktop.



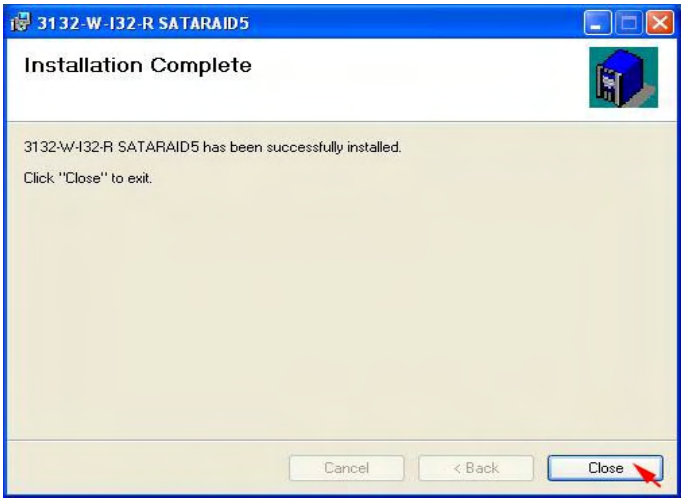
5. Click **Next>** to use the default installation folder.



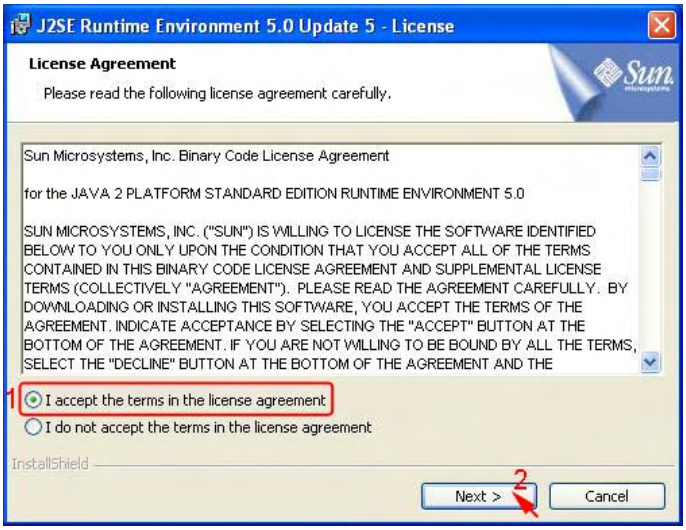
6. Click **Next>** to begin the installation.



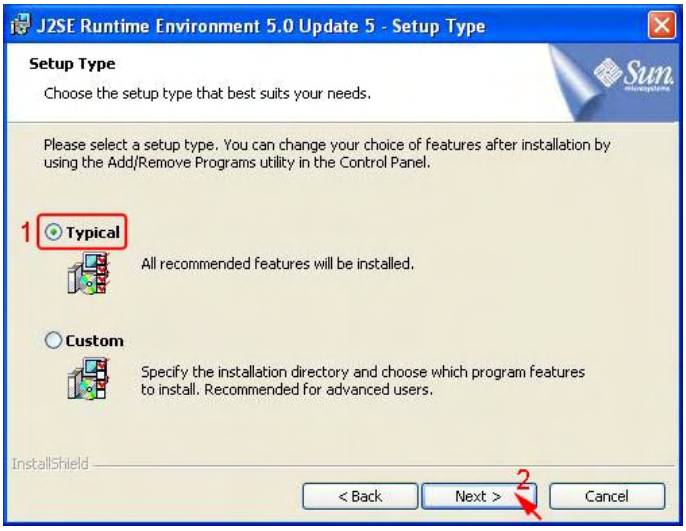
7. When SATARAID5 installation has completed, click **Close** to exit.



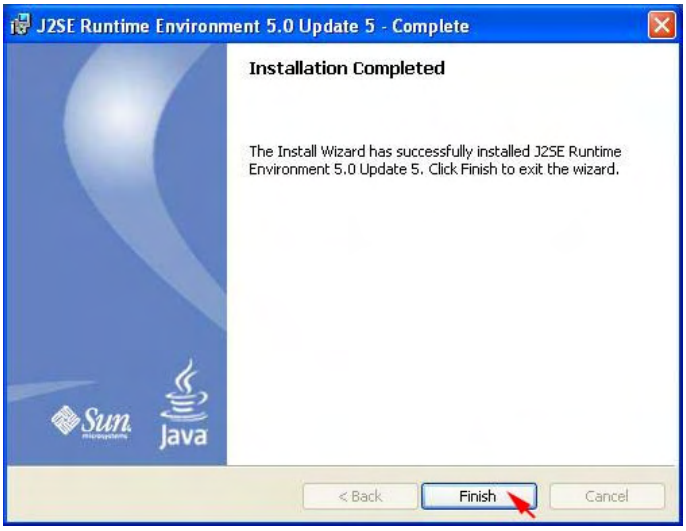
8. Select **I accept the terms in the license agreement**, click **Next>** to begin the Java platform installation.



9. Select **Typical**, click **Next>**.



10. When Java platform installation has completed, click **Finish** to exit.



11. Select **Start** > **All Programs** > **Silicon Image** > **SATARaid5Manager** to start the Array Manager software.

3.6.3 Disk Drive Mode Setup

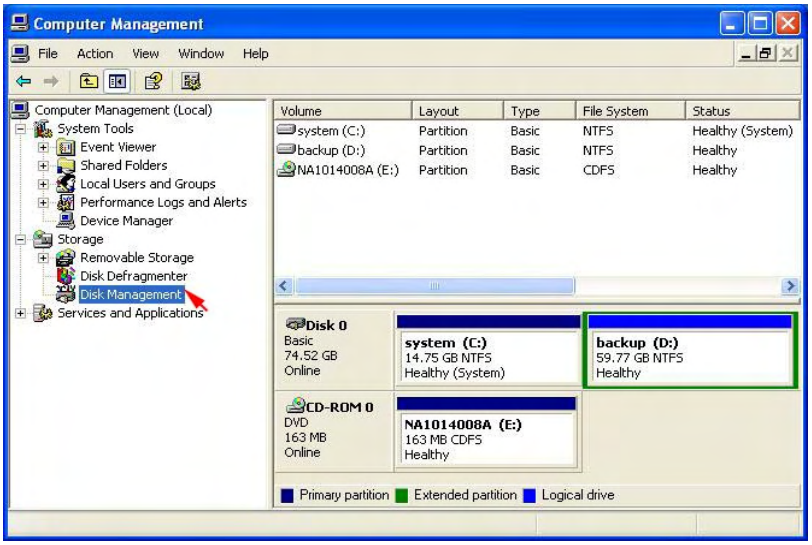
Disk Drive Mode setup will create the usable RAID partition to the computer. It is necessary to create the RAID before the allocating partition. Please refer to the chapter 4 for more detail.

3.6.4 Allocating Partitions on Windows XP 32-BIT/64-BIT

Before creating any partitions, RAID groups must first be created using the SATARaid5Manager utility. Once the sets have been created, allow the system to load Windows.

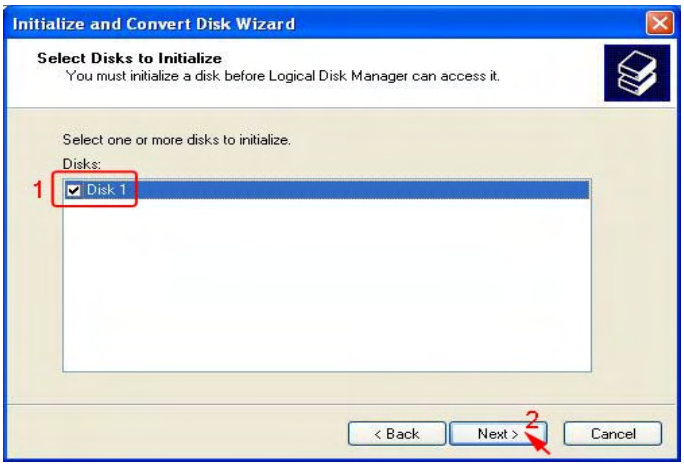
1. Right-click on **My Computer** icon and select **Manage** from the pop-up menu.

2. Select **Disk Management** under **Storage** to view the disk drives.

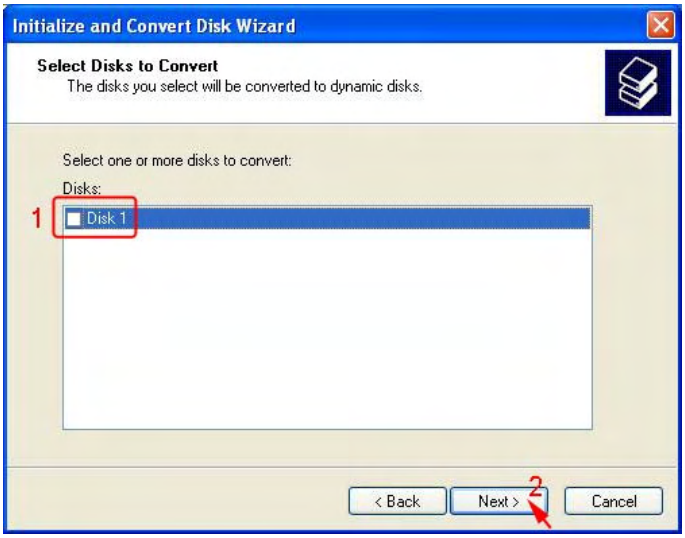


3. When **Initialize and Convert Disk Wizard** appears, click **Next>**.

4. Select the new disk to initialize, click **Next>**.

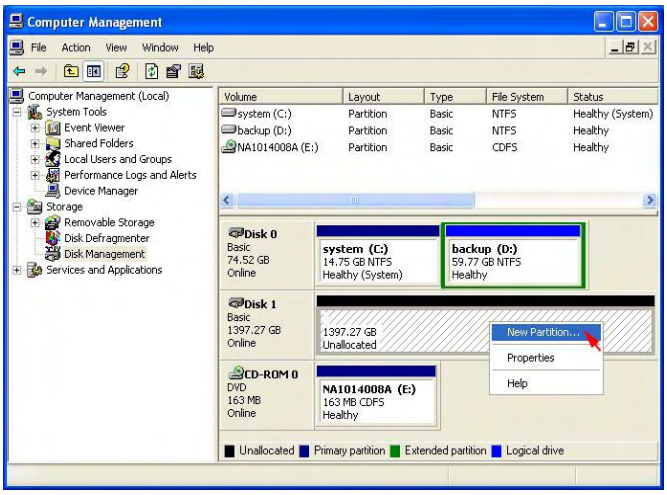


5. Do not click any disk to convert, click **Next>**.



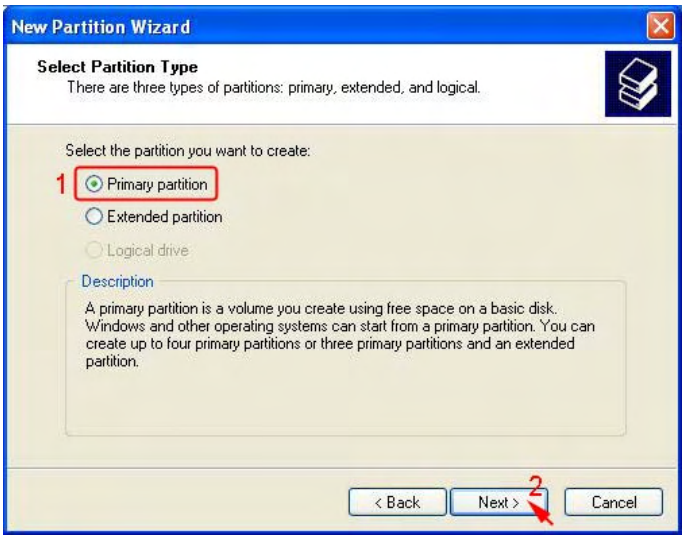
6. When the **Initialize and Convert Disk Wizard** has completed, click **Finish**.

7. Right-click on the **Unallocated** partition and select **New Partition…** from the pop-up menu.

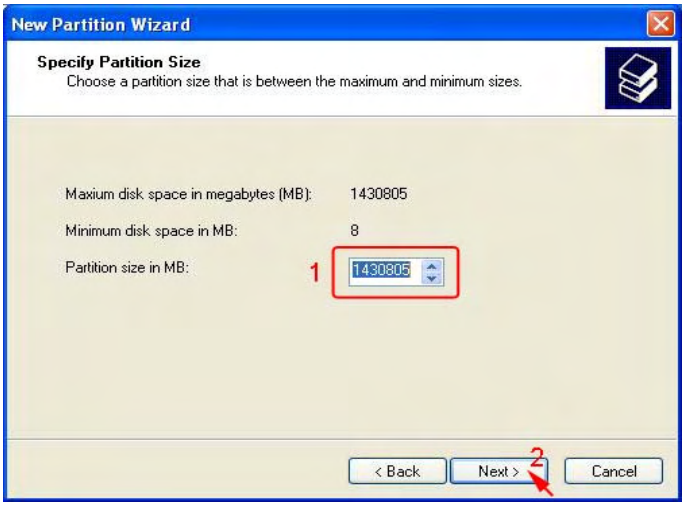


8. Click **Next>** to create a partition on a basic disk.

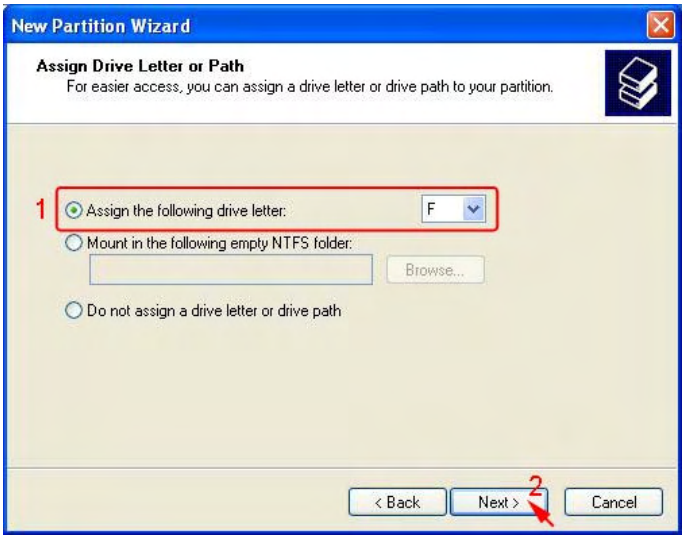
9. Select the partition type you want to create, click **Next>**.



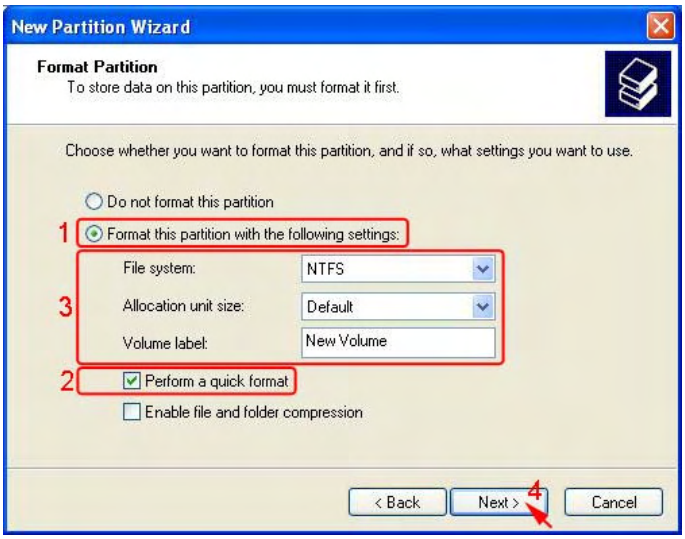
10. Specify the partition size you want to create, click **Next>**.



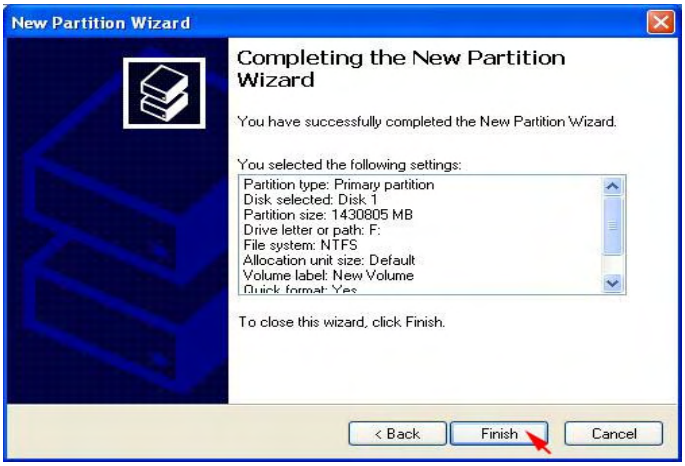
11. Assign the drive letter or path you want to create, than click **Next>**.



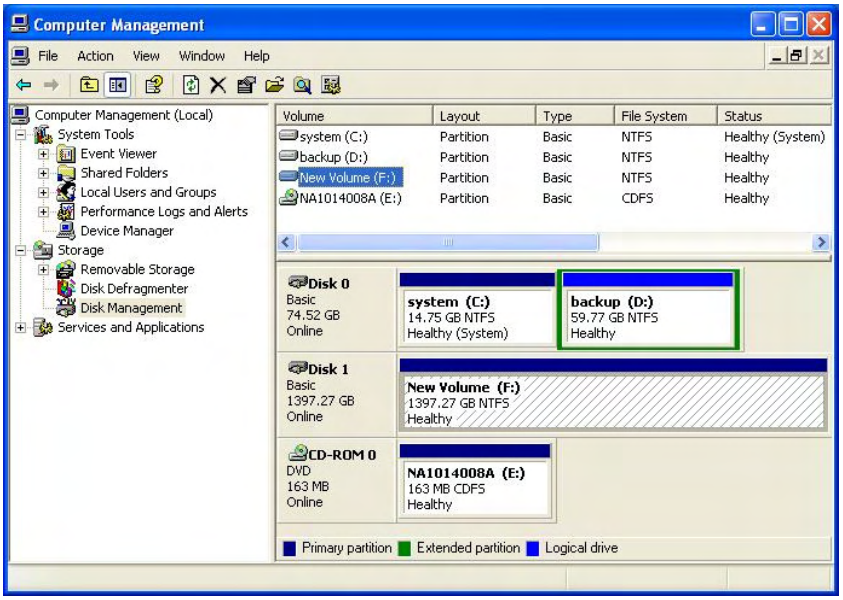
12. Click **Format this partition with the following settings** and **Perform a quick format**, setup the **File system**, **Allocation unit size**, **Volume label**, than click **Next>**.



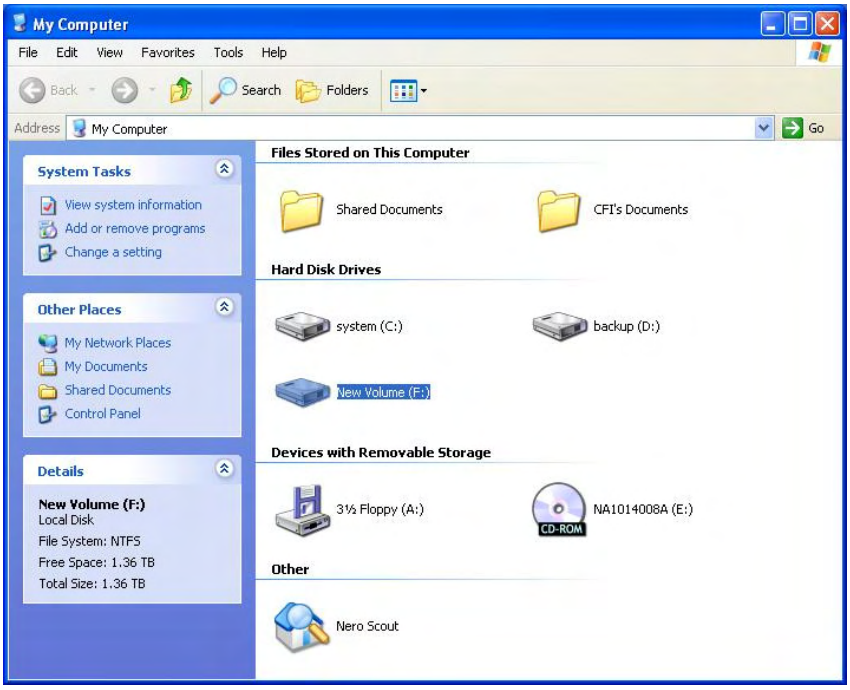
13. When the **New Partition Wizard** has completed, click **Finish**.



The status of the created partition in the Disk Management window will change to "**Formatting".** The percentage complete will be displayed. Depending upon the size of the partition, the format process may take several minutes. When completed, the status will change to **"Healthy"** and the name and drive letter will be updated. Once the disk reports Healthy, it appears to the computer and ready to use.



Repeat the above procedure if there are any other partitions. Close the Data Management window by clicking on the small boxed "X" in the top right corner of the window. Click on the "My Computer" icon on the Desktop. The new drives will be display and properly named. The new disks are now available for use.



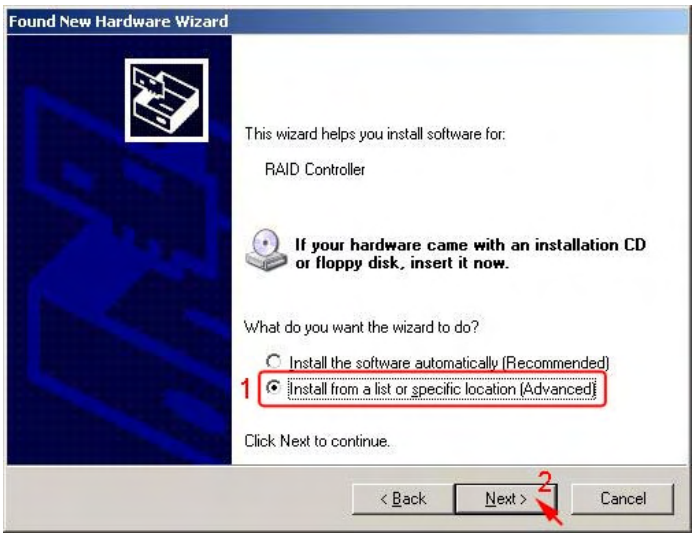
3.7 INSTALLING ON WINDOWS SERVER 2003 (32/64-BIT)

3.7.1 Installing eSATA Host Bus Adapter

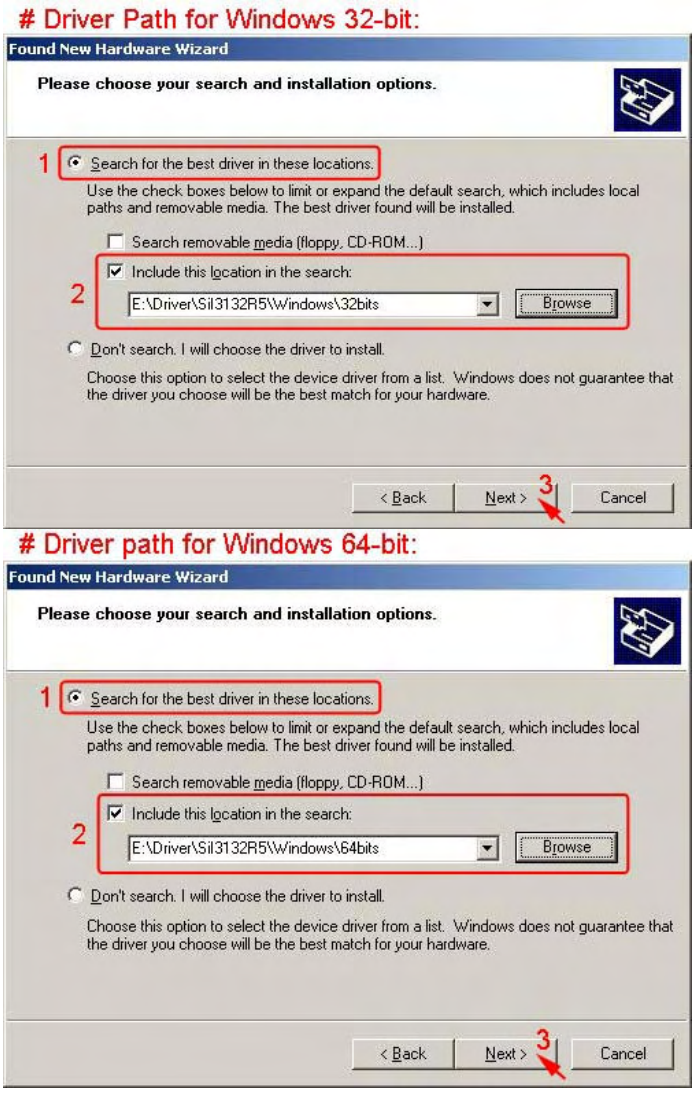
Follow the instruction below for eSATA HBA Driver installation:

1. Insert the Manual and Utilities CD in the CD-ROM drive.
2. When Windows started, new hardware will be found; Select **No, not this time**, click **Next>**.

3. Select **Install from a list or specific location (Advanced)**, click **Next>**.



4. Select **Search for the best driver in there location**, **Include this location in the search**, and click **Browse** to select the driver path, click **Next>**.

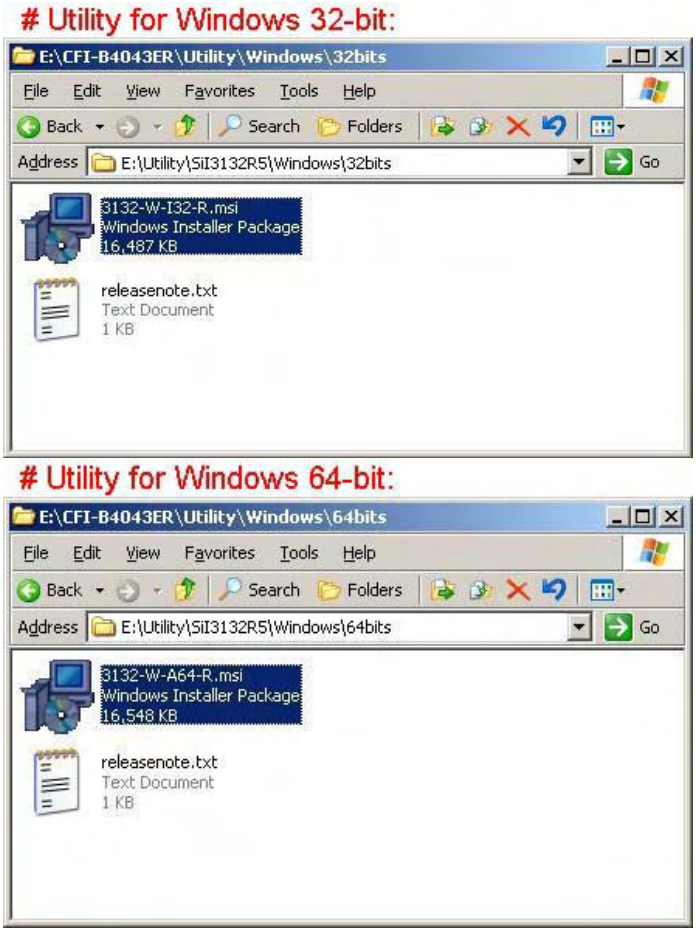


5. When the installation has completed, click **Finish**.

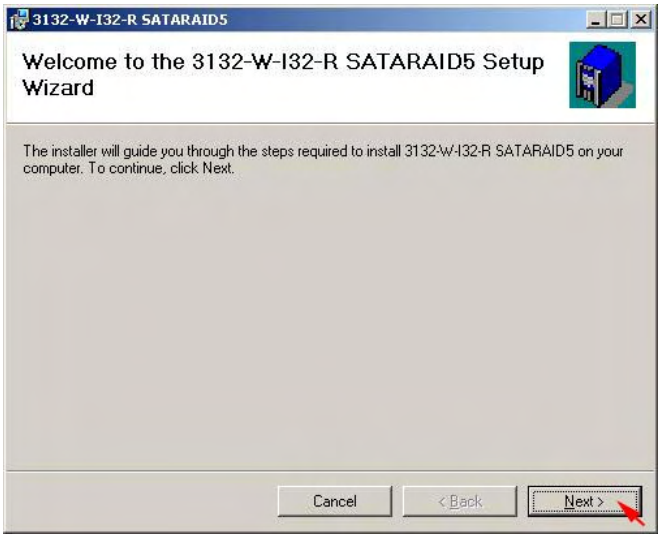
3.7.2 Installing SATARAID5 Utility

Follow the instructions below for the SATARAID5 utility:

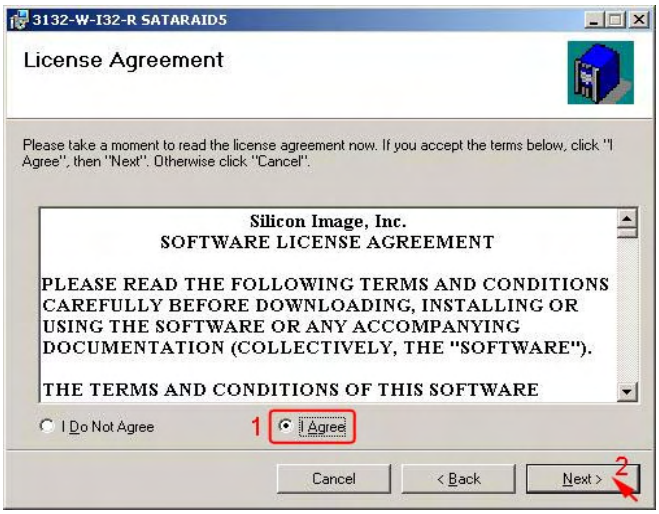
1. Open the Manual and Utilities CD and select the SATARAID5 Array Manager software from the Utility folder.
2. Double-click the utility file.



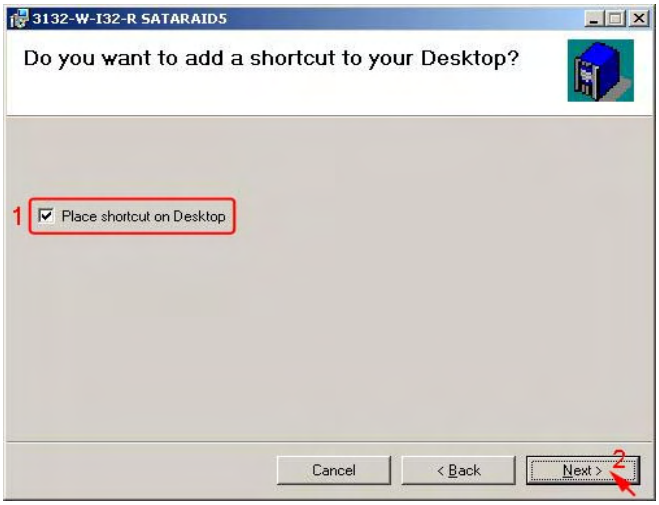
3. Click **Next>** to begin setup.



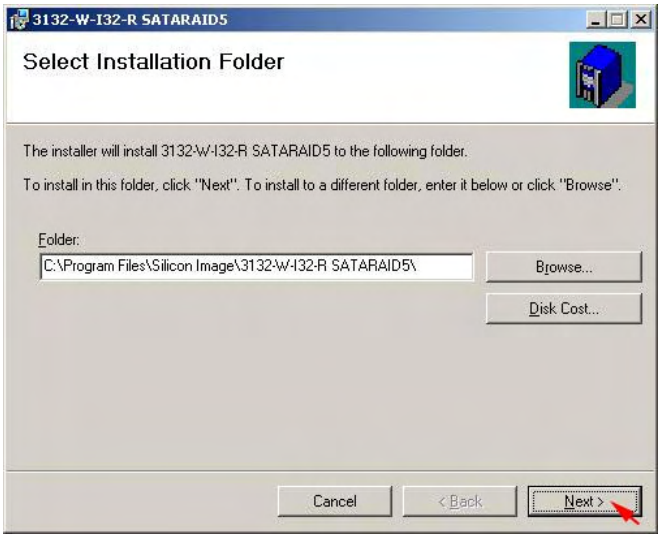
4. Select **I Agree**, click **Next>**.



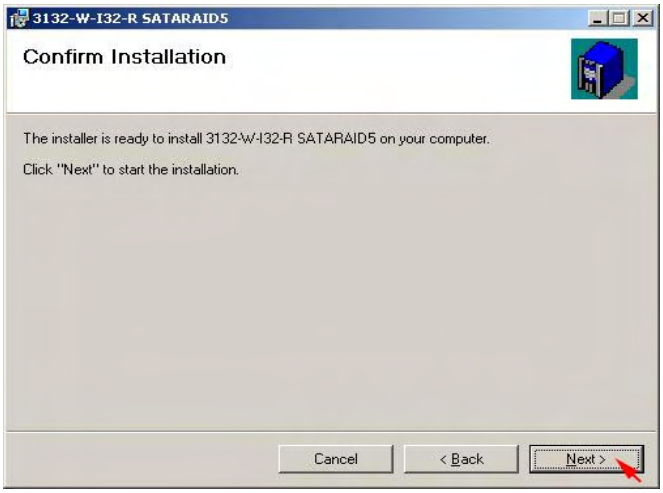
5. Select **Place shortcut on Desktop**, click **Next>** to create a shortcut on the desktop.



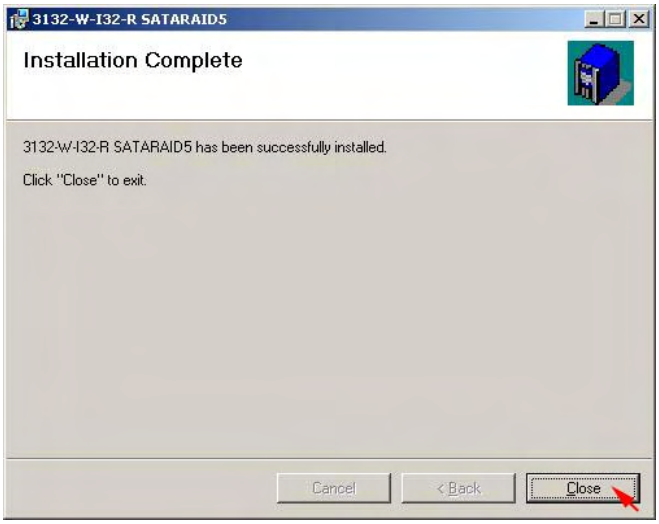
6. Click **Next>** to use the default installation folder.



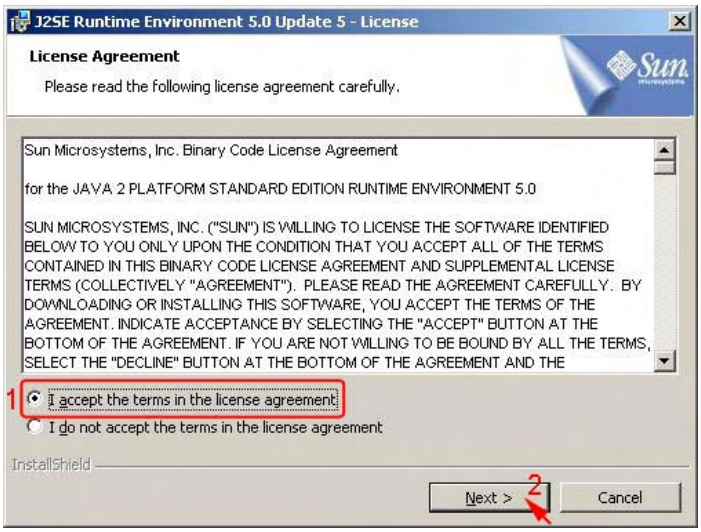
7. Click **Next>** to begin the installation.



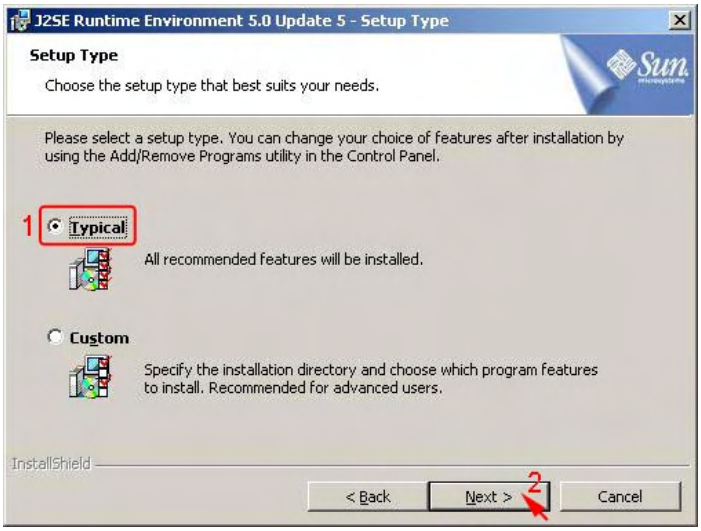
8. When SATARAID5 installation has completed, click **Close** to exit.



9. Select **I accept the terms in the license agreement**, click **Next>** to begin the Java platform installation.



10. Select **Typical**, click **Next>**.



11. When Java Runtime installation has completed, click **Finish** to exit.

12. Select **Start** > **All Programs** > **Silicon Image** > **SATARaid5Manager** to start the Array Manager software.

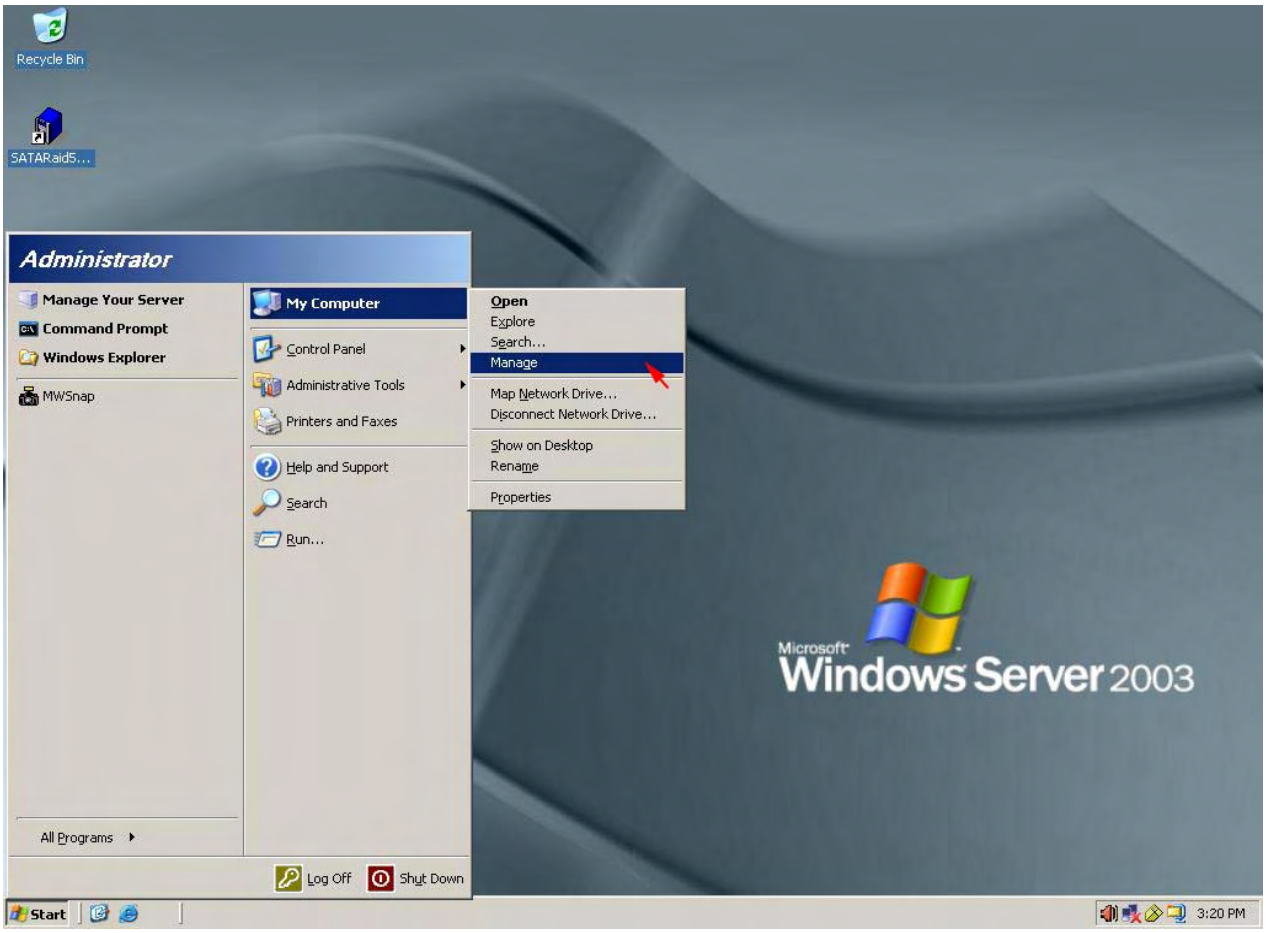
3.7.3 Disk Drive Mode Setup

Disk Drive Mode setup will create the usable RAID partition to the computer. It is necessary to create the RAID before the allocating partition. Please refer to the chapter 4 for more detail.

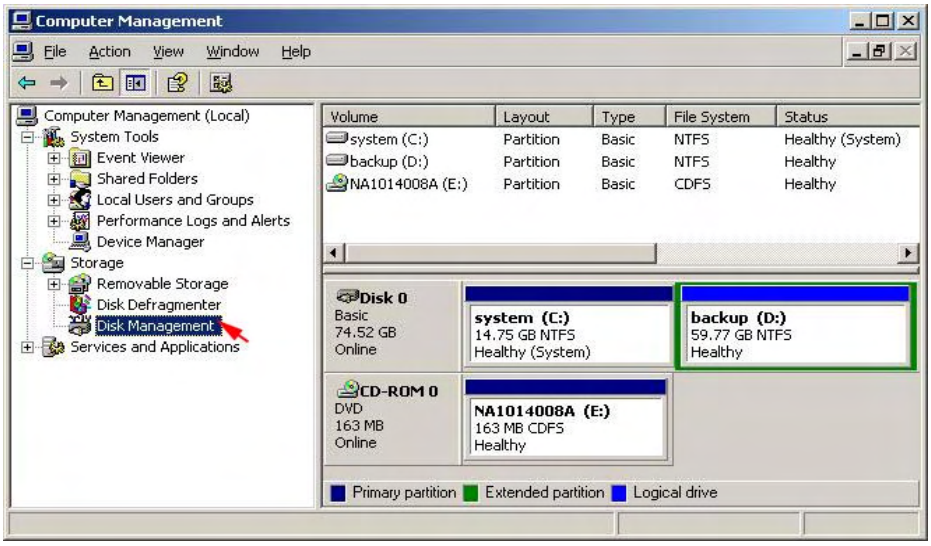
3.7.4 Allocating Partitions

Before creating any partitions, RAID groups must first be created using the SATARaid5 Manager utility (see Chapter 4).

1. Right-click on **My Computer** icon and select **Manage** from the pop-up menu.

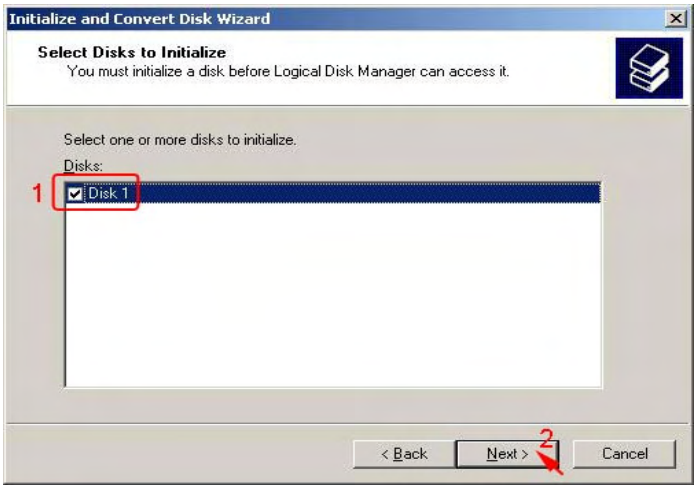


2. Select **Disk Management** under **Storage** to view the disk drives.

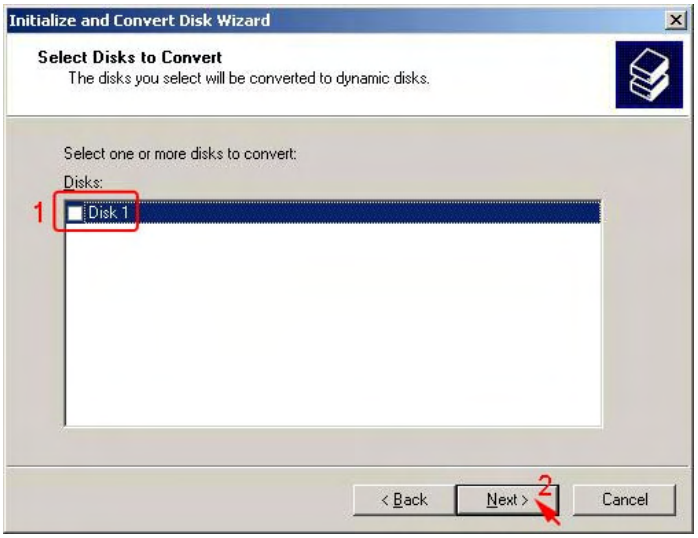


3. When **Initialize and Convert Disk Wizard** appears, click **Next>**.

4. Select the new disk to initialize, click **Next>**.

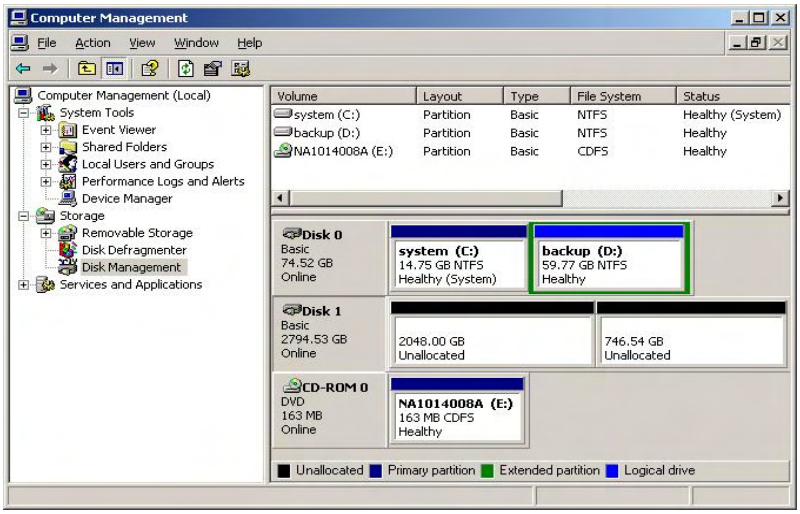


5. Do not click any disk to convert, click **Next>**.

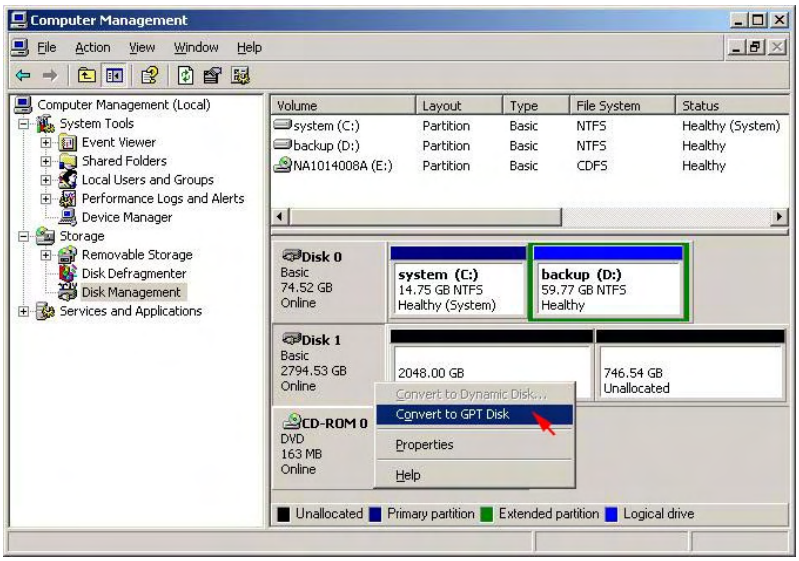


6. When the **Initialize and Convert Disk Wizard** has completed, click **Finish**.

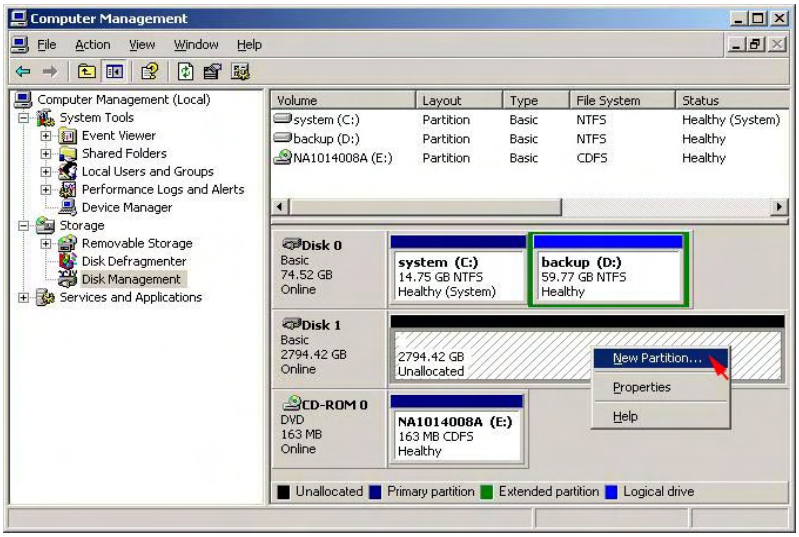
7. Windows Server 2003 SP1 or later system supports **GPT Disk** which supports disk volume greater than 2TB.



8. Right-click on the "**Basic Disk"** and select "**Convert to GPT Disk"** from the pop-up menu.

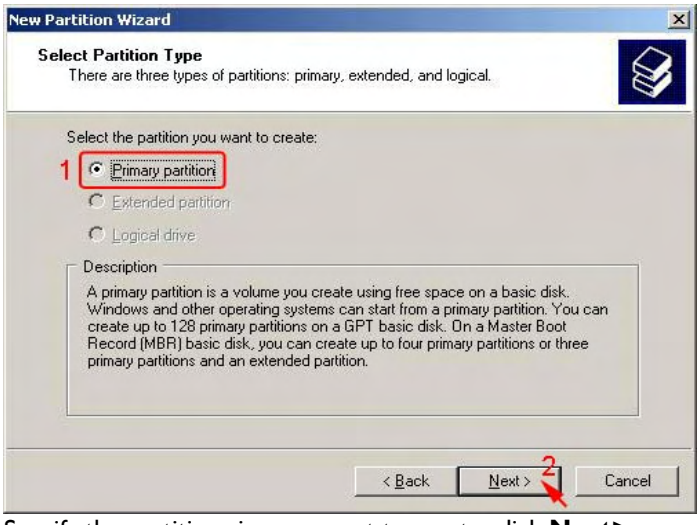


9. Right-click on the "**Unallocated"** partition and select "**New Partition…"** from the pop-up menu.

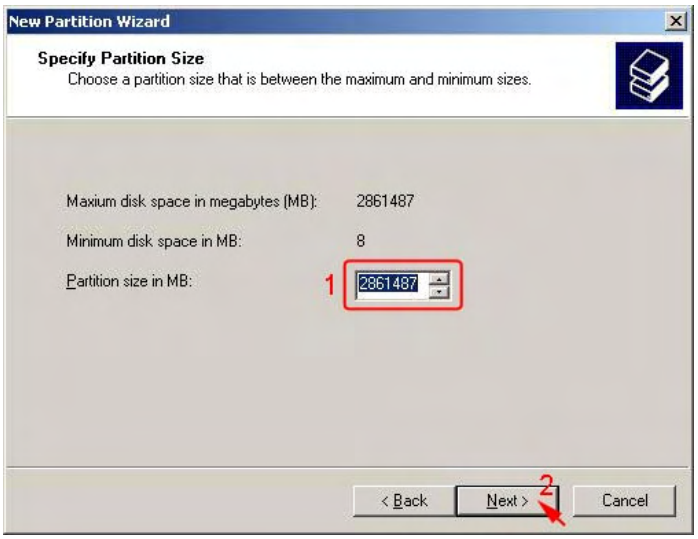


10. Click **Next>** to create a partition on a basic disk.

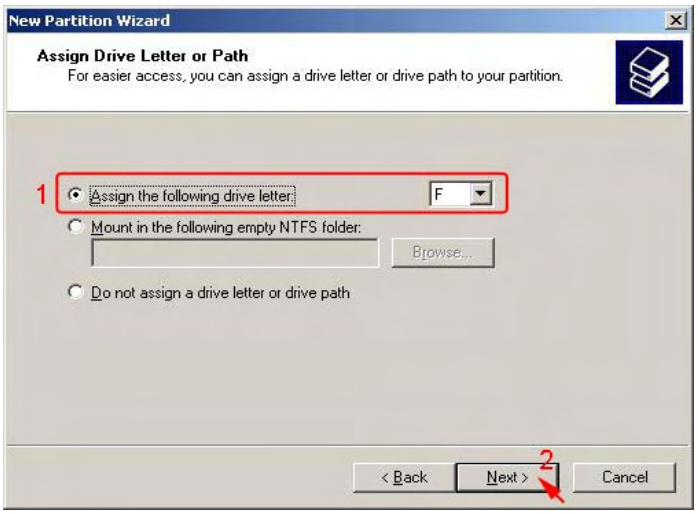
11. Select the partition to create, click **Next>**.



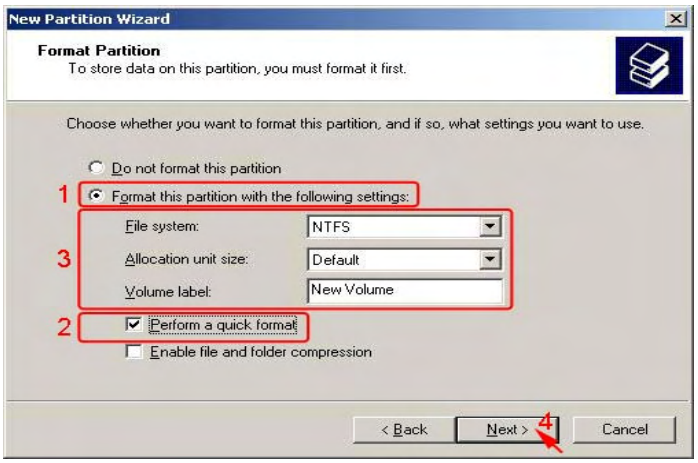
12. Specify the partition size you want to create, click **Next>**.



13. Assign the drive letter or path you want to create, click **Next>**.

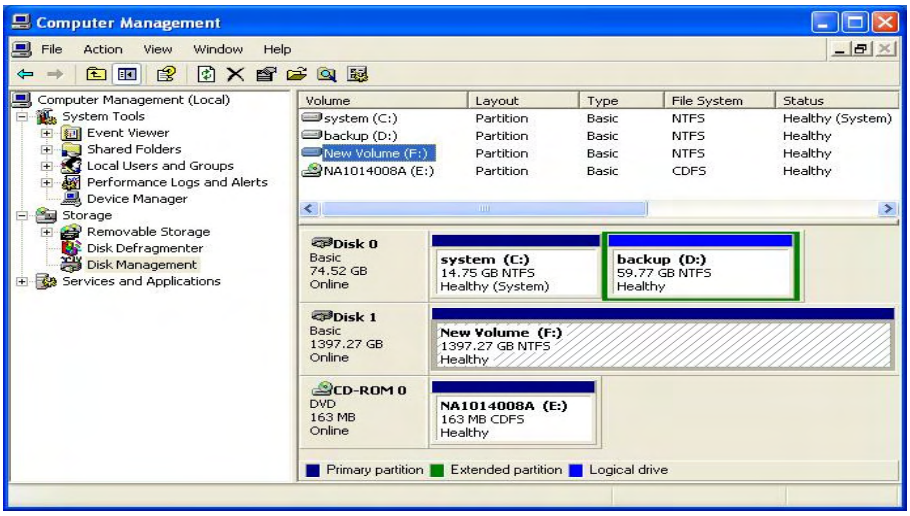


14. Click **Format this partition with the following settings** and **Perform a quick format**, setup the **File system**, **Allocation unit size**, **Volume label**, click **Next>**.

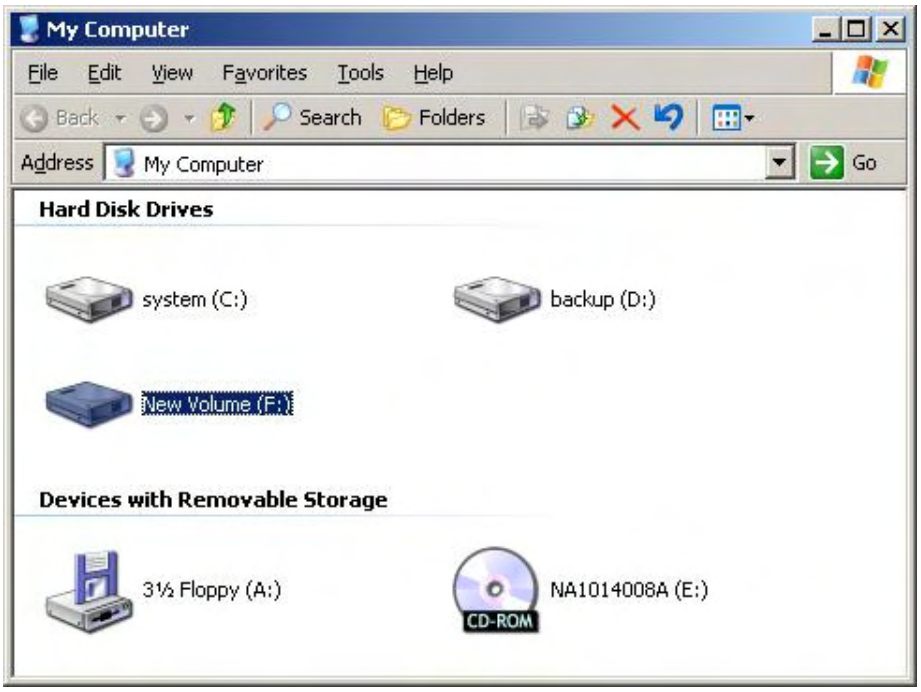


15. When the **New Partition Wizard** has completed, click **Finish**.

The status of the created partition in the Disk Management window will change to "**Formatting".** The percentage complete will be displayed. Depending upon the size of the partition, the format process may take several minutes. When completed, the status will change to **"Healthy"** and the name and drive letter will be updated. Once the disk reports Healthy, it appears to the computer and ready to use.



Repeat the above procedure if there are any other partitions. Close the Data Management window by clicking on the small boxed "X" in the top right corner of the window. Click on the "My Computer" icon on the Desktop. The new drives will be display and properly named. The new disks are now available for use.



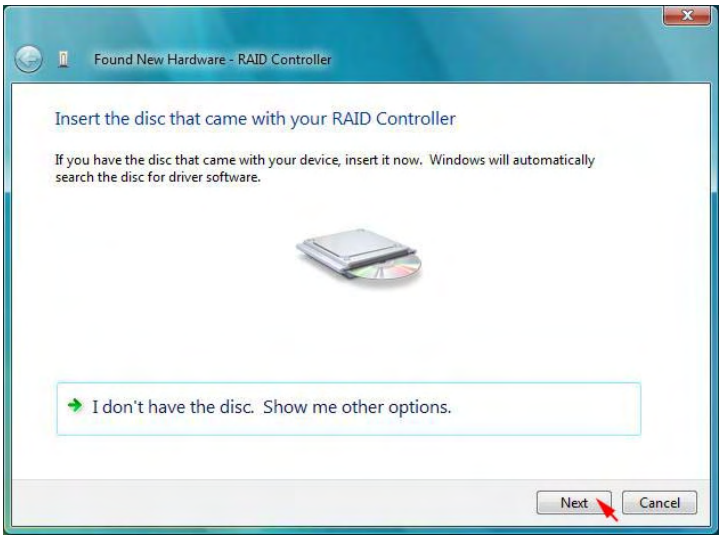
3.8 INSTALLING ON WINDOWS VISTA (32/64-BIT)

3.8.1 Installing eSATA Host Bus Adapter

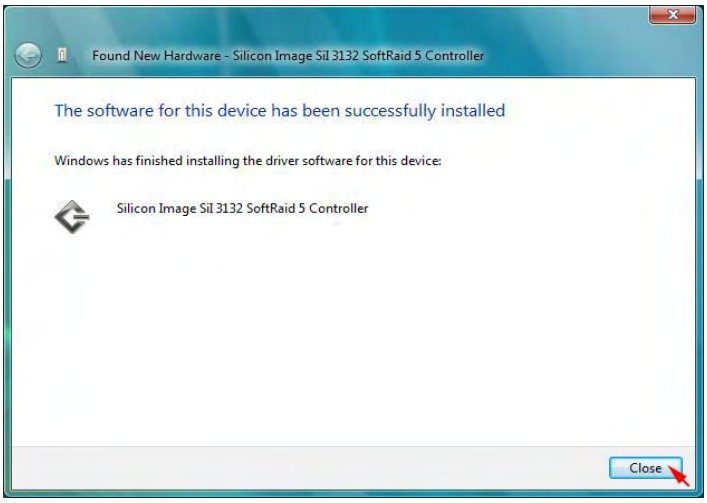
Follow the instruction below for eSATA HBA Driver installation:

1. Insert the Manual and Utilties CD in the CD-ROM drive.
2. Insert the Setup and Installation Repository CD in the CD-ROM drive.
3. When the Windows started, new hardware will be found. Select "**Locate and Install driver software (recommended)**".

4. Insert the disc that came with your RAID Controller, click **Next**.



5. When the installation has completed, click **Close**.



3.8.2 Installing SATARAID5 Utility

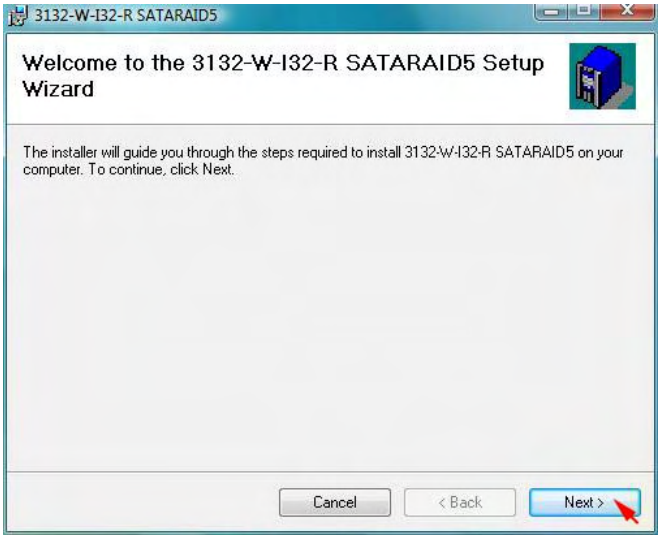
Follow the instructions below for the SATARAID5 utility:

1. Open the Manual and Utilities CD and select the SATARAID5 Array Manager software from the Utility folder.
2. Double-click the utility file.

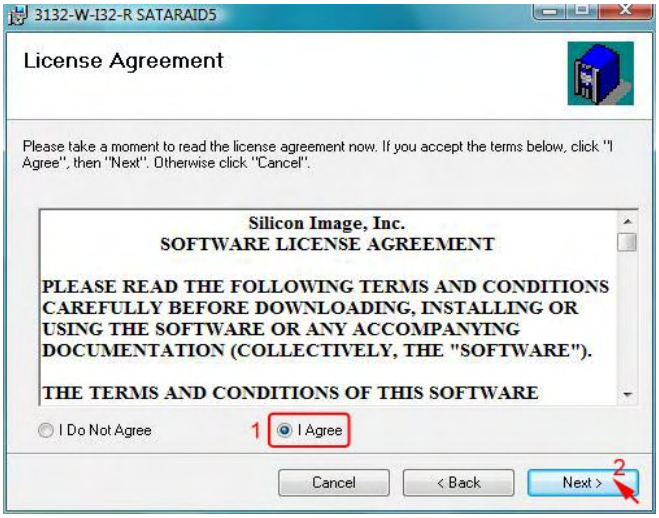
Utility for Windows 32-bit:

Utility for Windows 64-bit:

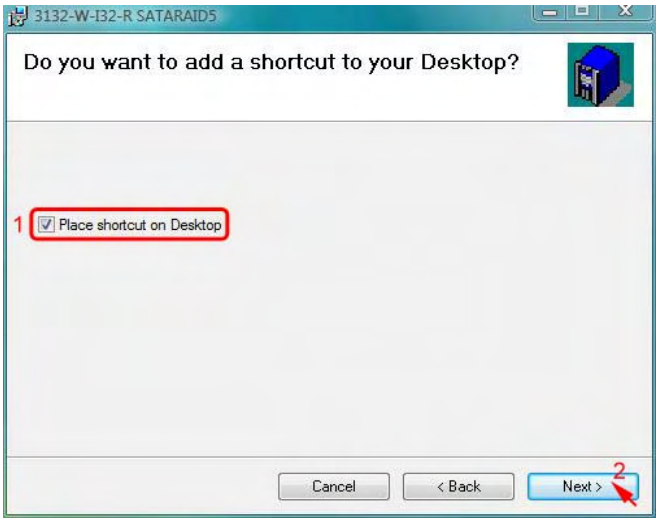
3. Click **Next>** to begin setup.



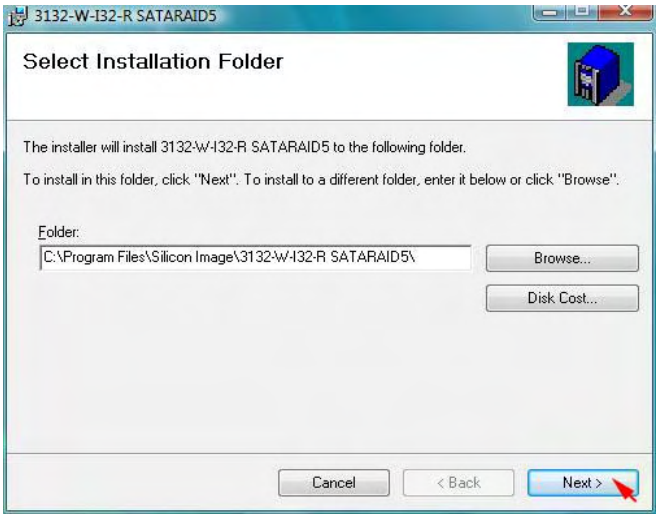
4. Select **I Agree**, click **Next>**.



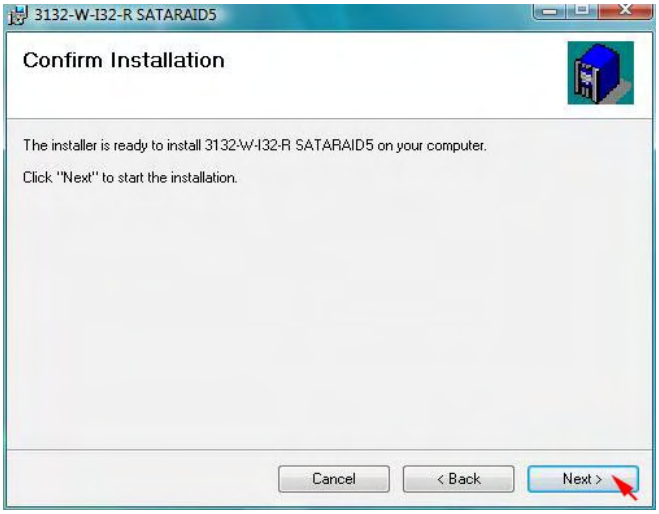
5. Select **Place shortcut on Desktop**, click **Next>** to create a shortcut on the desktop.



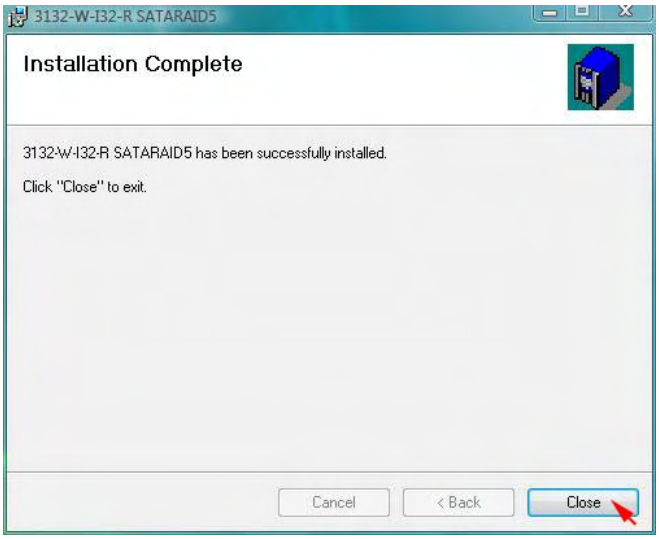
6. Click **Next>** to use the default installation folder.



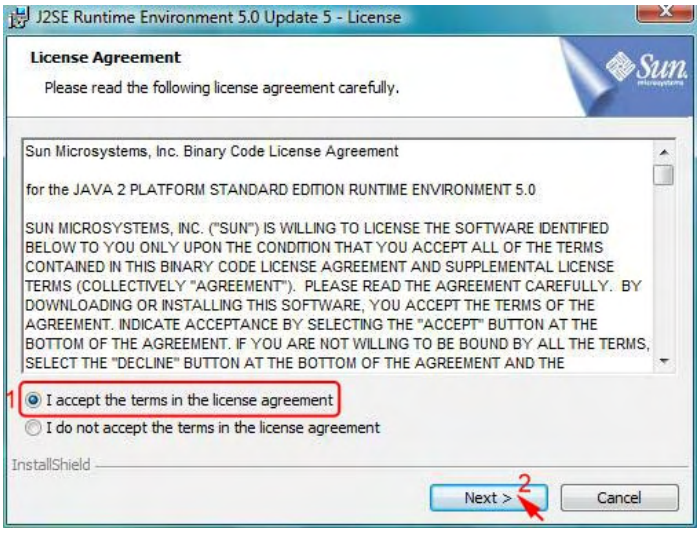
7. Click **Next>** to begin the installation.



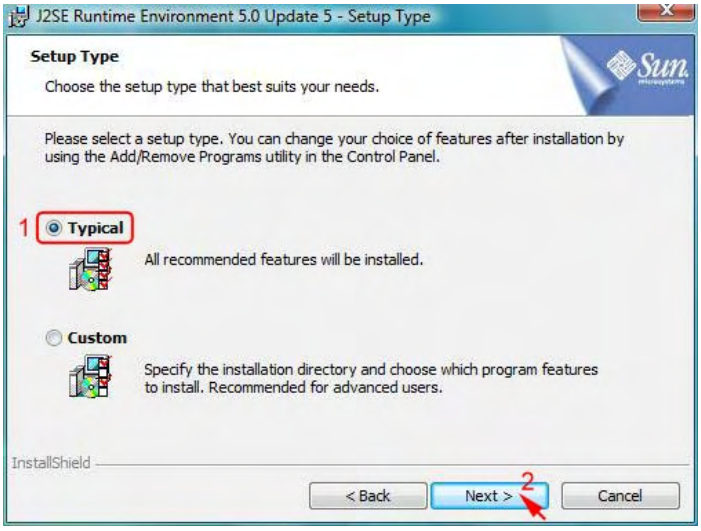
8. When SATARAID5 installation has completed, click **Close** to exit.



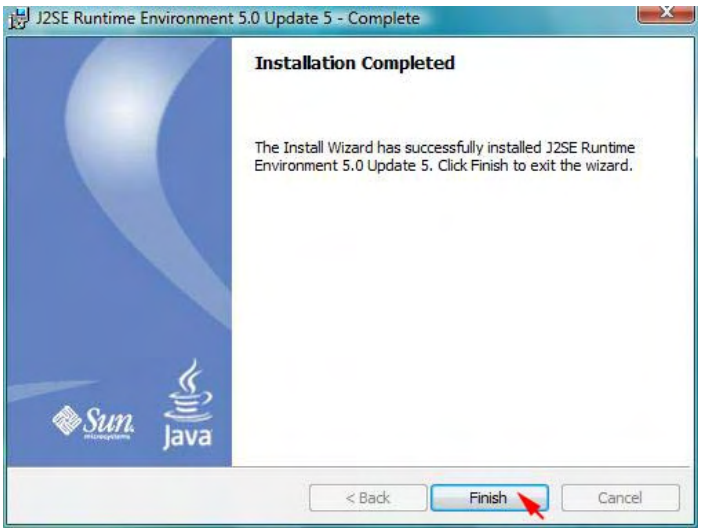
9. Select **I accept the terms in the license agreement**, than click **Next>** to begin the Java platform installation.



10. Select **Typical**, than click **Next>**.



11. When Java platform installation has completed, click **Finish** to exit.



12. Select **Start** > **All Programs** > **Silicon Image** > **SATARaid5Manager** to start the Array Manager software.

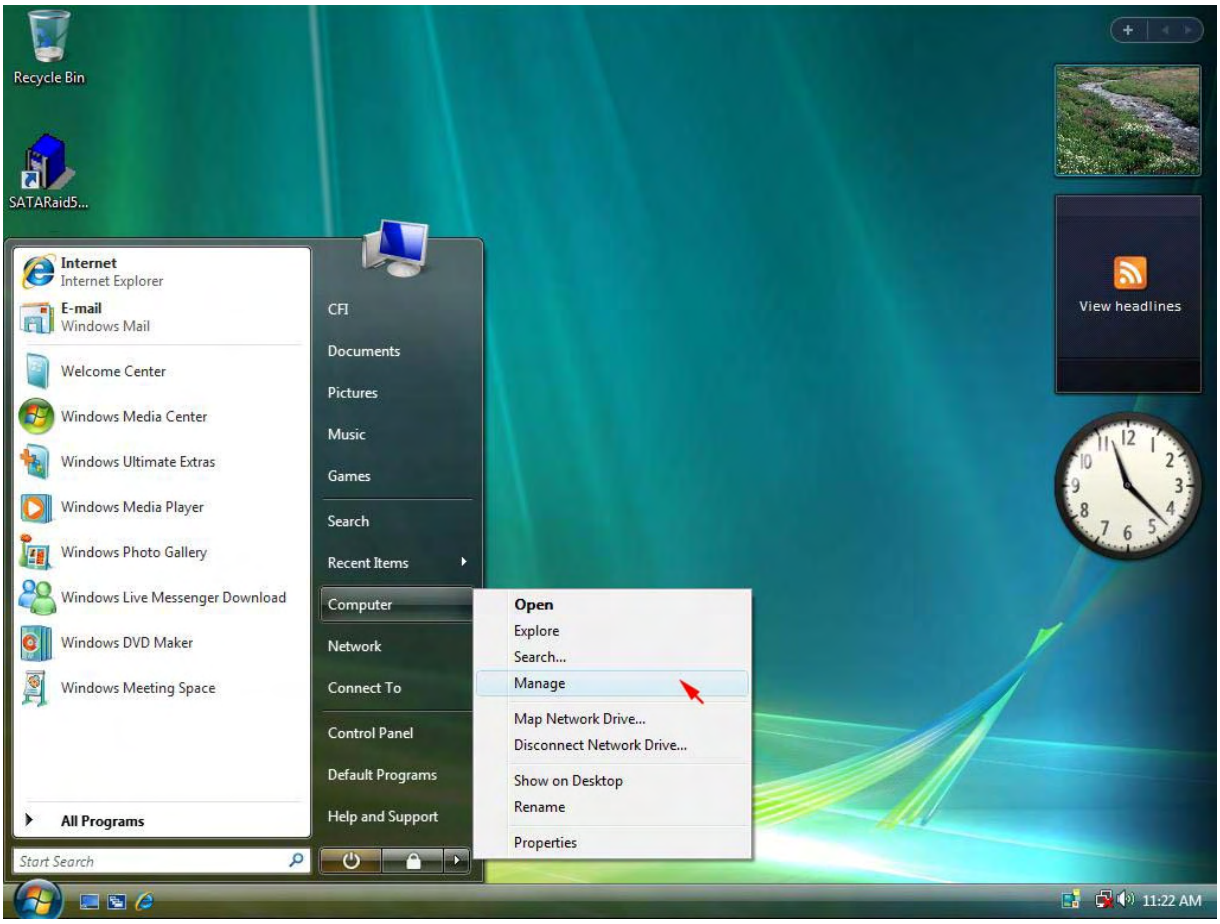
3.8.3 Disk Drive Mode Setup

Disk Drive Mode setup will create the usable RAID partition to the computer. It is necessary to create the RAID before the allocating partition. Please refer to the chapter 4 for more detail.

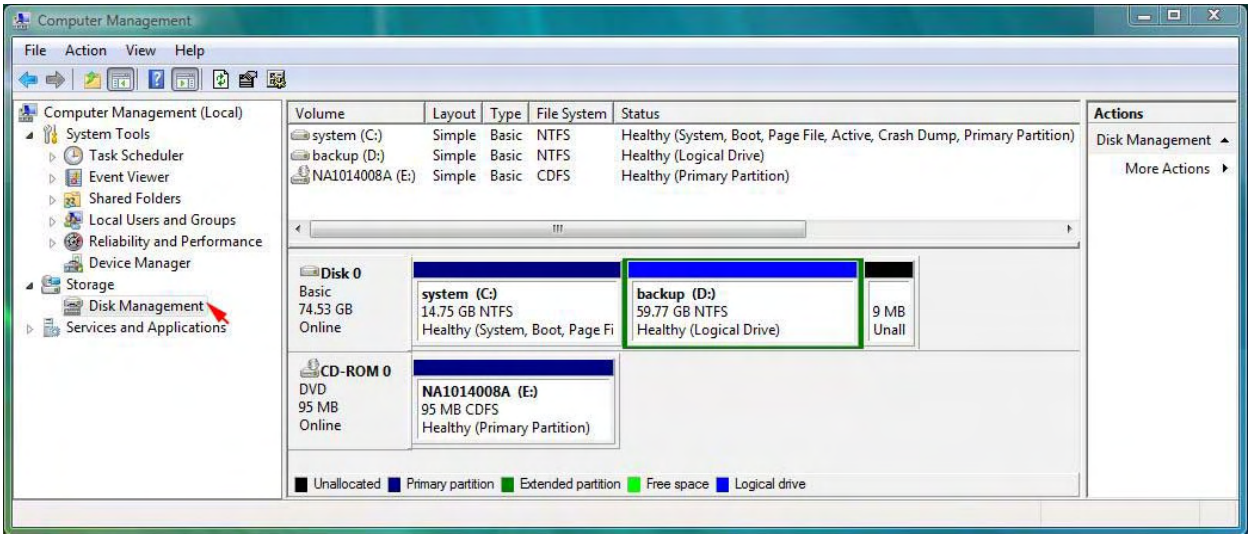
3.8.4 Allocating Partitions

Before creating any partitions, RAID groups must first be created using the SATARaid5 Manager utility (see Chapter 4).

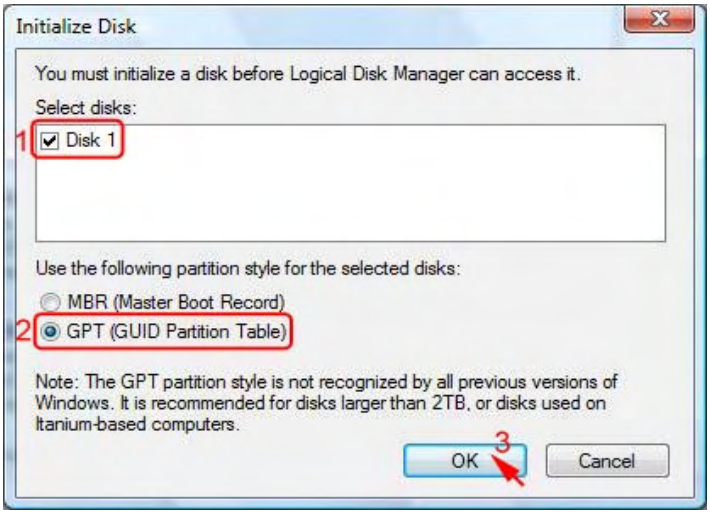
1. Right-click on **My Computer** icon and select **Manage** from the pop-up menu.



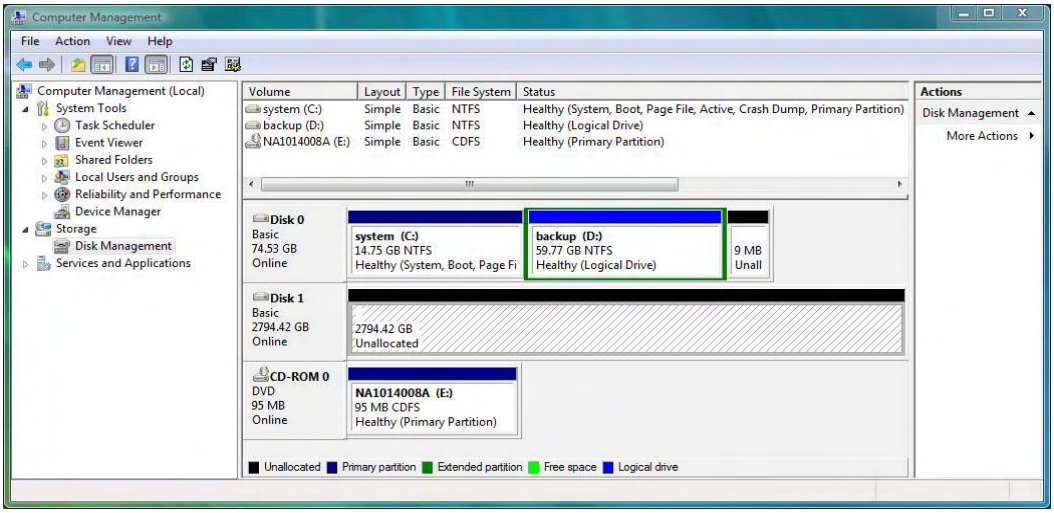
2. Select **Disk Management** under **Storage** to view the disk drives.



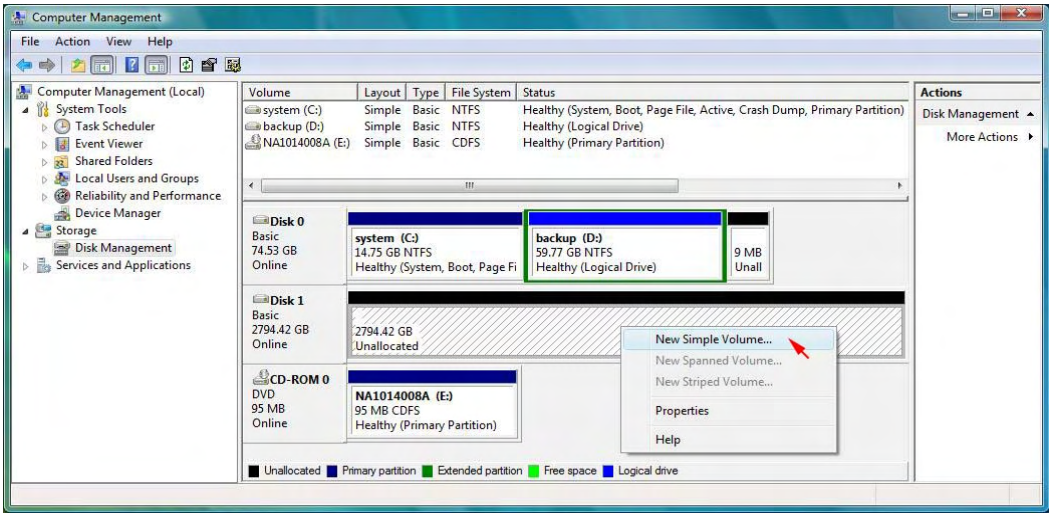
3. When **Initialize Disk Wizard** appears, select **Disk 1** and **GPT (GUID Partition Table)**, and click **OK**.



4. Windows Vista system supports **GPT disk** which supports disk volume greater than 2TB.

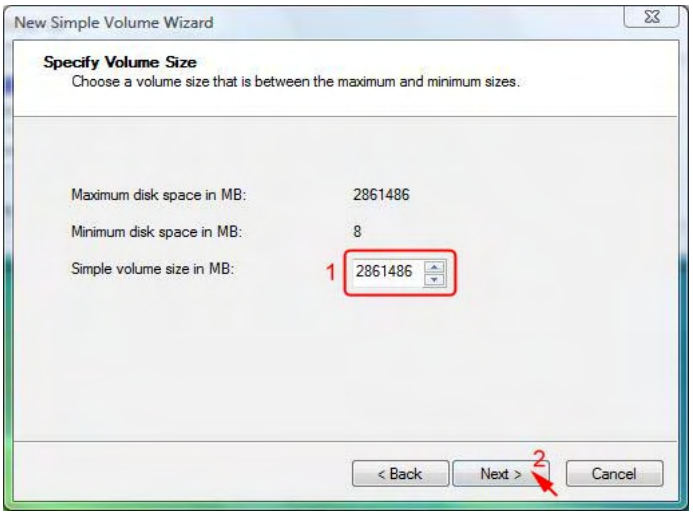


5. Right-click on the **Unallocated** partition and select **New Single Volume…** from the pop-up menu.

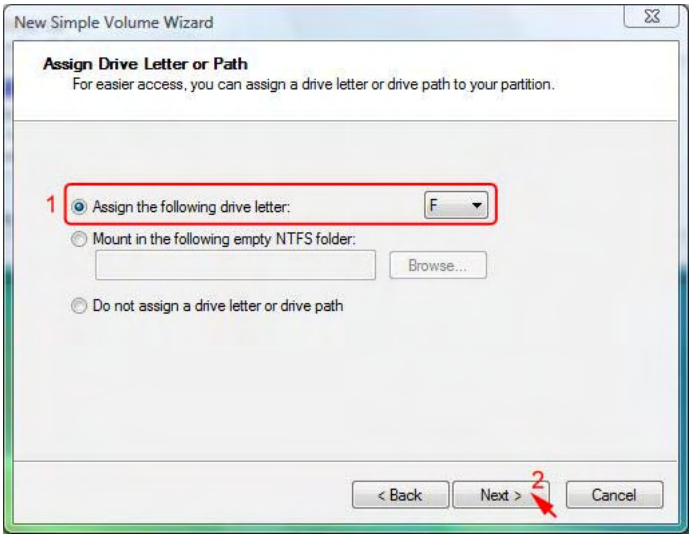


6. Click **Next>** to create the partition.

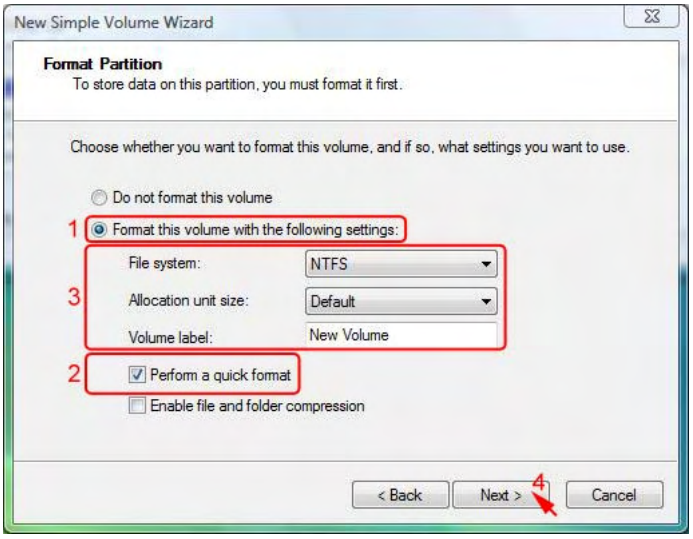
7. Specify the partition size you want to create, than click **Next>**.



8. Assign the drive letter or path you want to create, than click **Next>**.

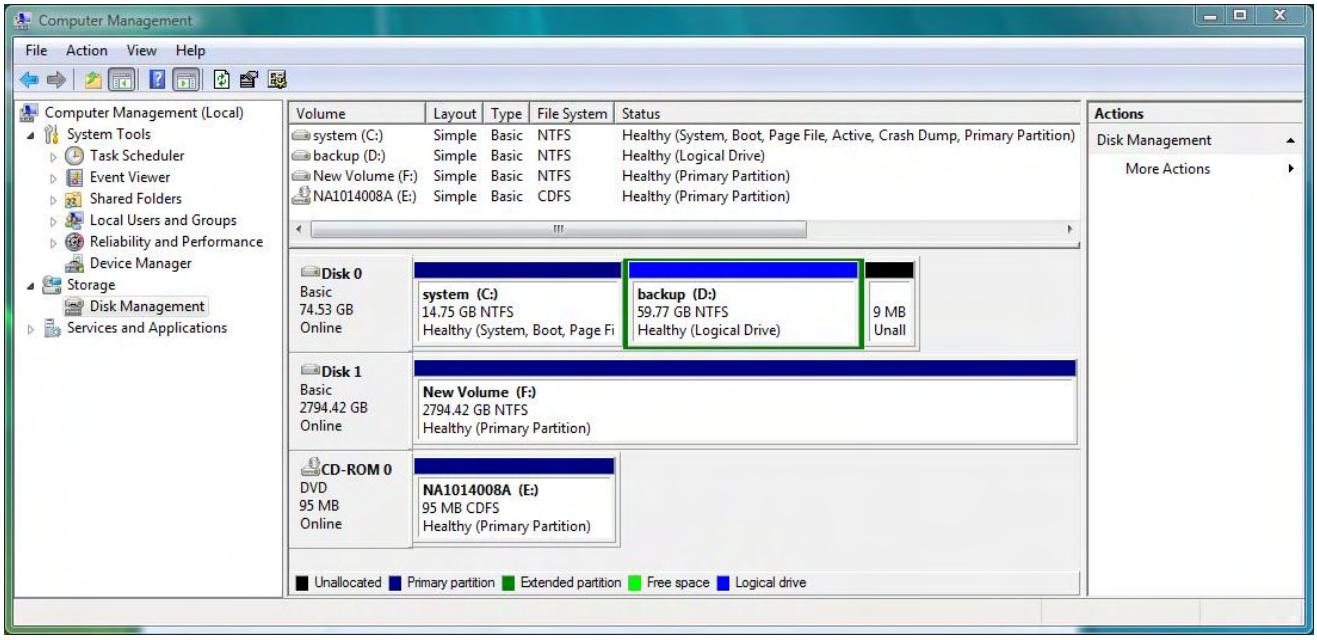


9. Click **Format this partition with the following settings** and **Perform a quick format**, setup the **File system**, **Allocation unit size**, **Volume label**, than click **Next>**.

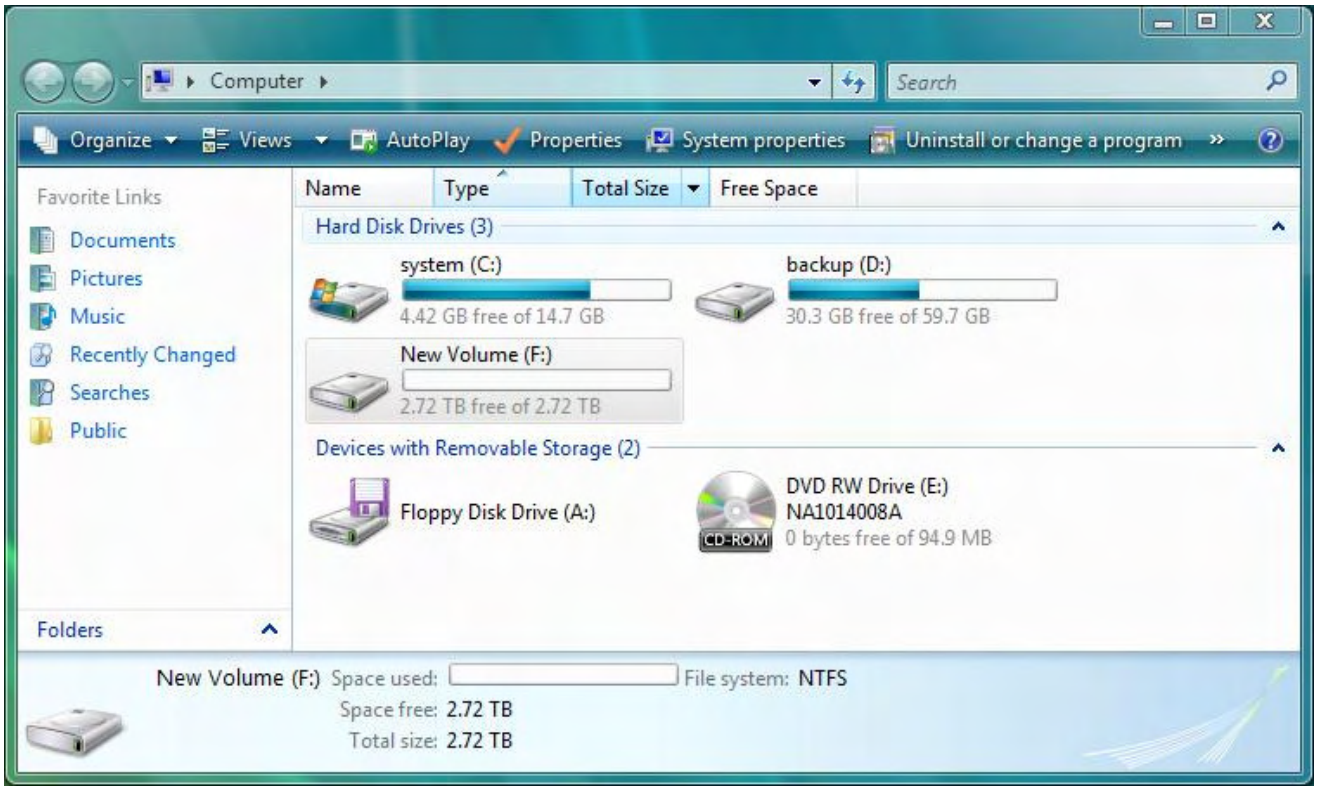


10. When the **New Partition Wizard** has completed, click **Finish**.

The status of the created partition in the Disk Management window will change to "**Formatting".** The percentage complete will be displayed. Depending upon the size of the partition, the format process may take several minutes. When completed, the status will change to **"Healthy"** and the name and drive letter will be updated. Once the disk reports Healthy, it appears to the computer and ready to use.



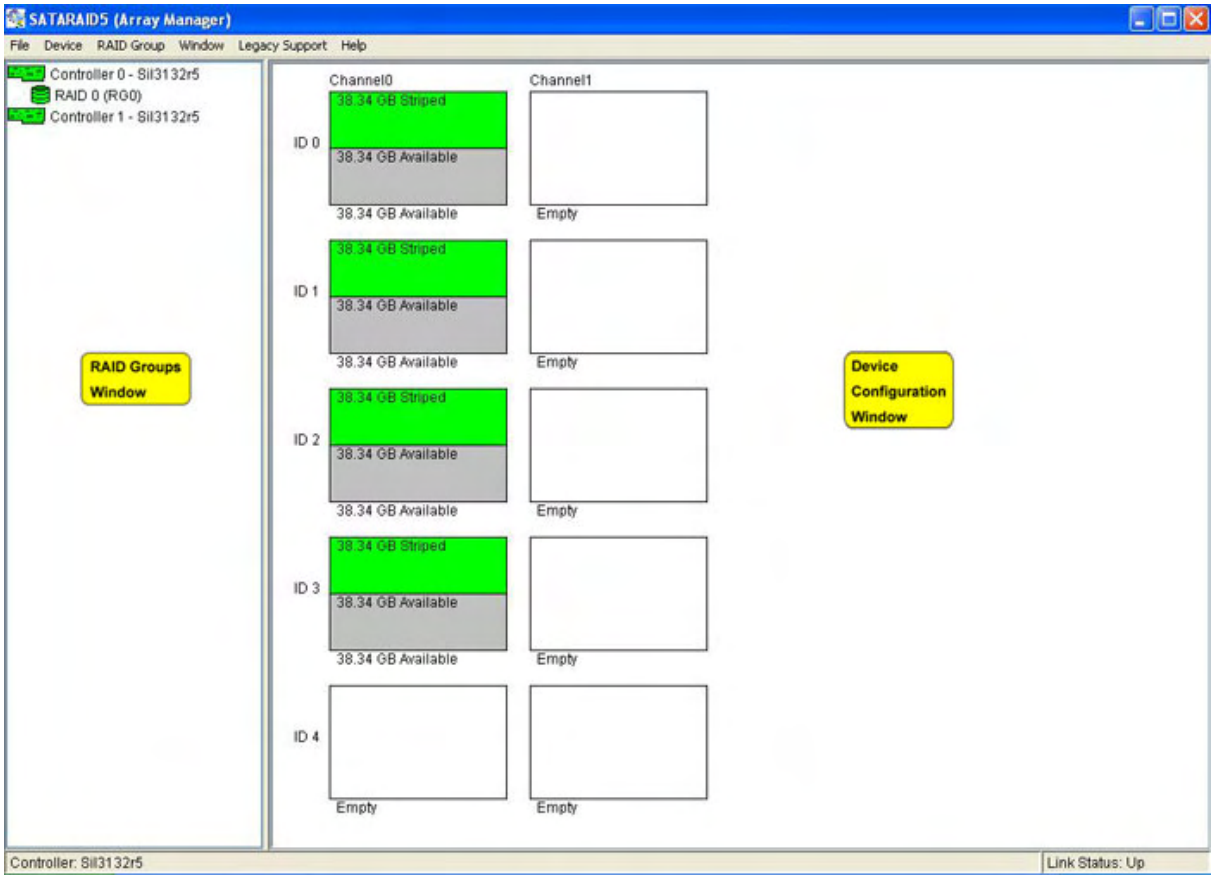
Repeat the above procedure if there are any other partitions. Close the Data Management window by clicking on the small boxed "X" in the top right corner of the window. Click on the "My Computer" icon on the Desktop. The new drives will be display and properly named. The new disks are now available for use.



Chapter 4 -SATARAID5 ARRAY MANAGER

4.1 OVERVIEW

The SATARAID5 Array Manager is the Graphical User Interfaces (GUI) which allows you to create and manage RAID volumes. The Manager divides into two sections, RAID Groups Windows and Device Configuration Windows, as seen below.



The RAID Groups window identifies Host Bus Adapters and configured RAID Groups. For systems with more than one Silicon Image Host Bus Adapter installed, you can switch between cards by selecting the desired card in the RAID Groups Window.

When a controller is selected, the RAID Groups currently defined on that controller are also shown in the RAID Groups Window. Selecting a specific RAID Group will highlight the segments associated with that volume in the Device Configuration Window.

The Device Configuration window identifies all physical drives and their partitions.

Throughout the Manager, different colors are used to indicate the different status. The status can be identied as follow:

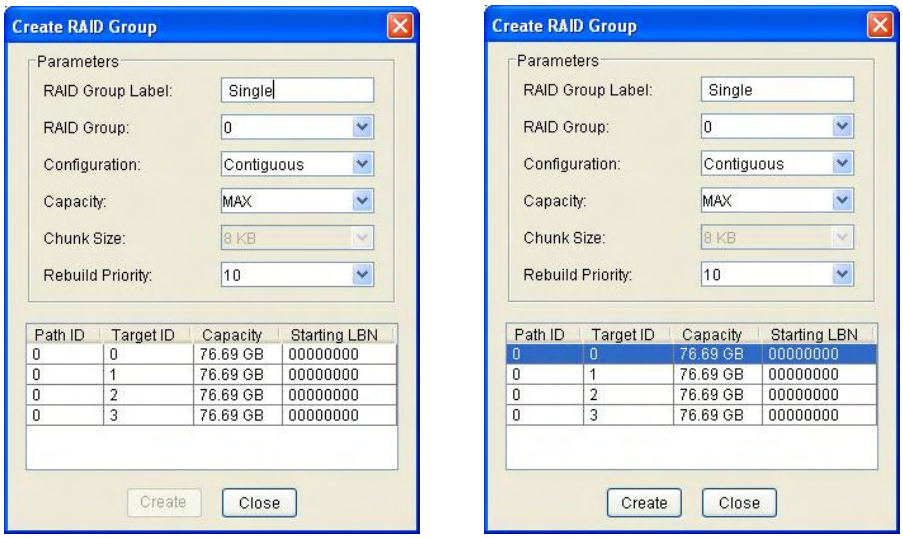
COLOR	STATUS
Green	Good.
Yellow	Warning. The service degraded and action required.
Red	Failed.
Grey	Unused.

4.2 CREATING RAID GROUPS

To begin creating a new RAID Group, select "Create RAID Group" from the RAID Group menu, or right click on a controller in the RAID Groups window. Select "Create RAID Group" from the pop-up menu. The "Create RAID Group dialog" appears. **(Maximum five hard drives per RAID group.)**

4.2.1 Contiguous RAID Groups

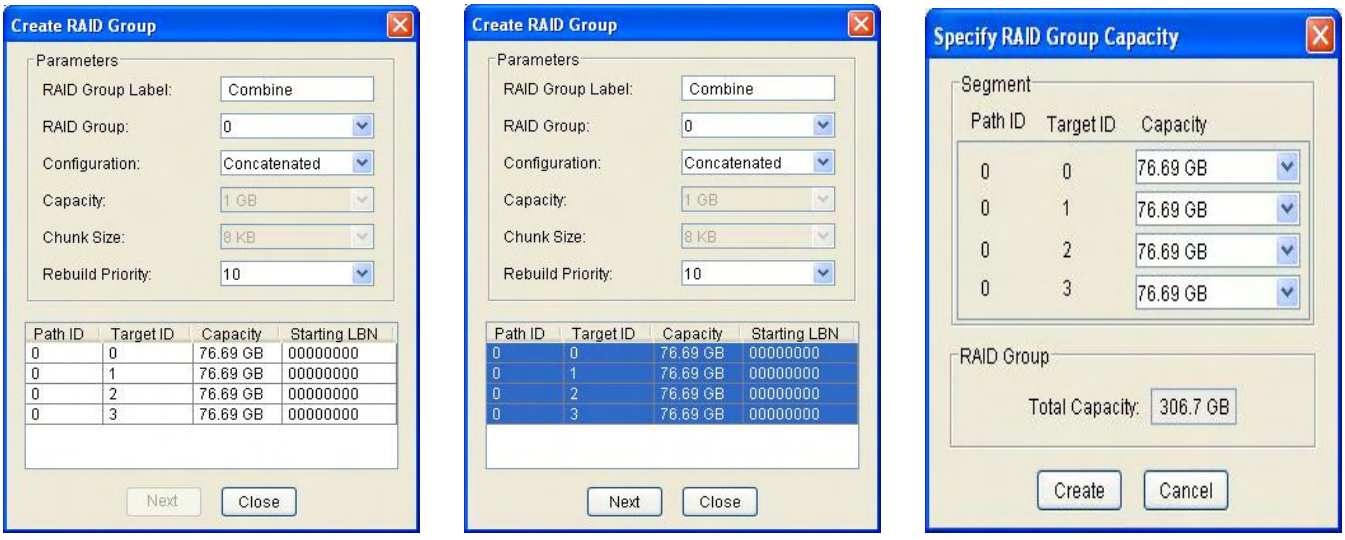
Contiguous RAID Groups (JBOD Mode) allow the user to select a segment of disk drive or a disk drive. Select the disk and its options (detailed in Section 4.2.7). Press "Create" to create the RAID Group.



4.2.2 Concatenated RAID Groups

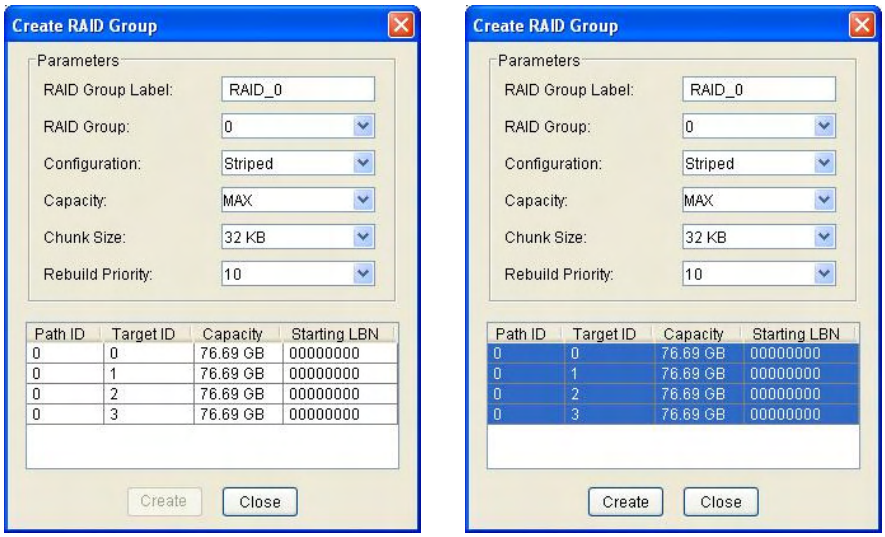
Concatenated RAID Groups (Spanning Mode) allow the user to select different sized segments for each member of the volume.

For Concatenated volumes, a dialog box will appear allowing the user to select the individual segment sizes from each disk. Select two or more disks and its options (detailed in Section 4.2.7). Press "Create" to create the RAID Group.



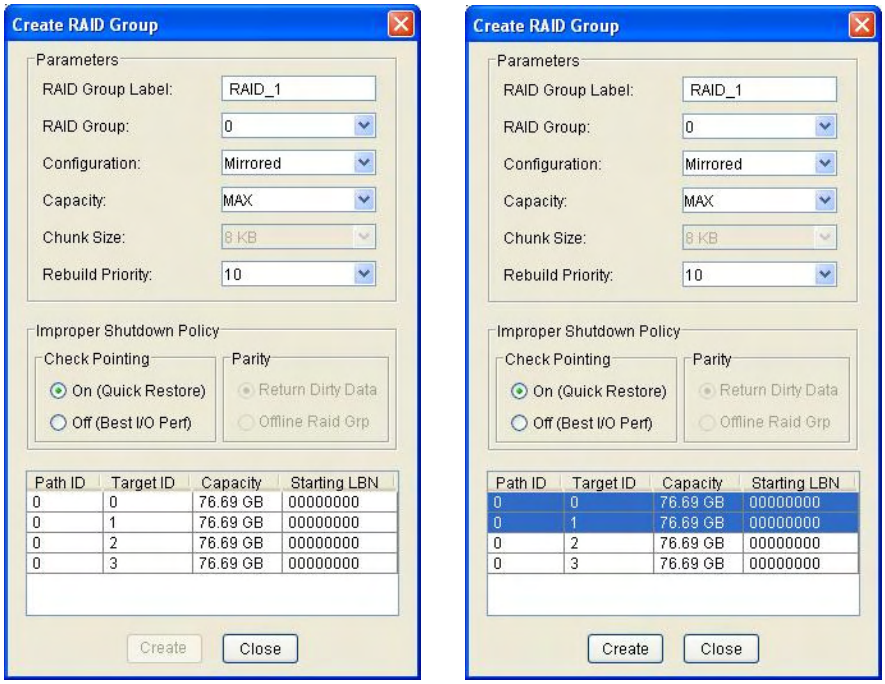
4.2.3 Striped RAID Groups

Striped RAID Groups (RAID 0) allow the user to select minimum of 2 or more disks for each member of the volume. Enter the desired values and press "Create" to create the RAID Group (Example below).



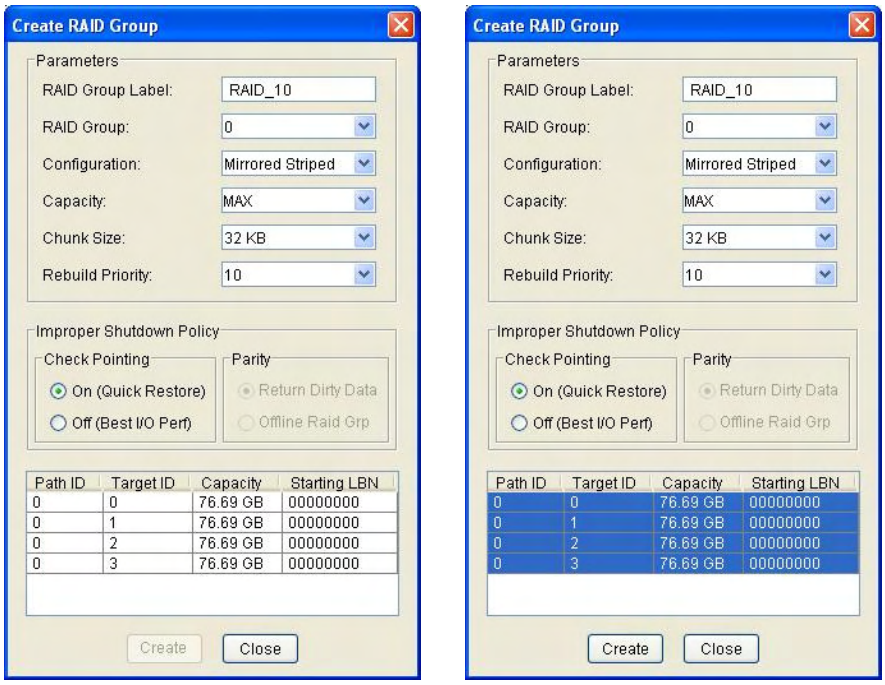
4.2.4 Mirrored RAID Groups

Mirrored RAID Groups (RAID 1) allow the user to select two disks for each member of the volume. Select two or more disk and its options (detailed in Section 4.2.7). Press "Create" to create the RAID Group.



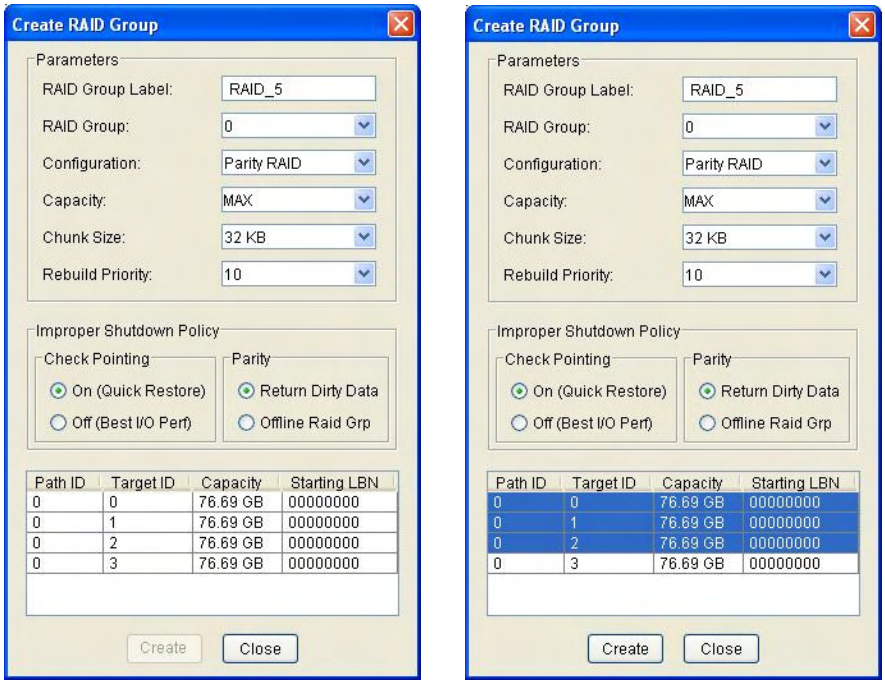
4.2.5 Mirrored Striped RAID Groups

Mirrored Striped RAID Groups (RAID 10) allow the user to select minimum of 4 disks for each member of the volume. Select all four disks and its options (detailed in Section 4.2.7). Press "Create" to create the RAID Group.



4.2.6 Parity RAId Groups

Parity RAID Groups (RAID 5) allow the user to select minimum of 3 or more disks for each member of the volume. Select three or more disks and its options (detailed in Section 4.2.7). Press "Create" to create the RAID Group.



4.2.7 RAID Groups Options

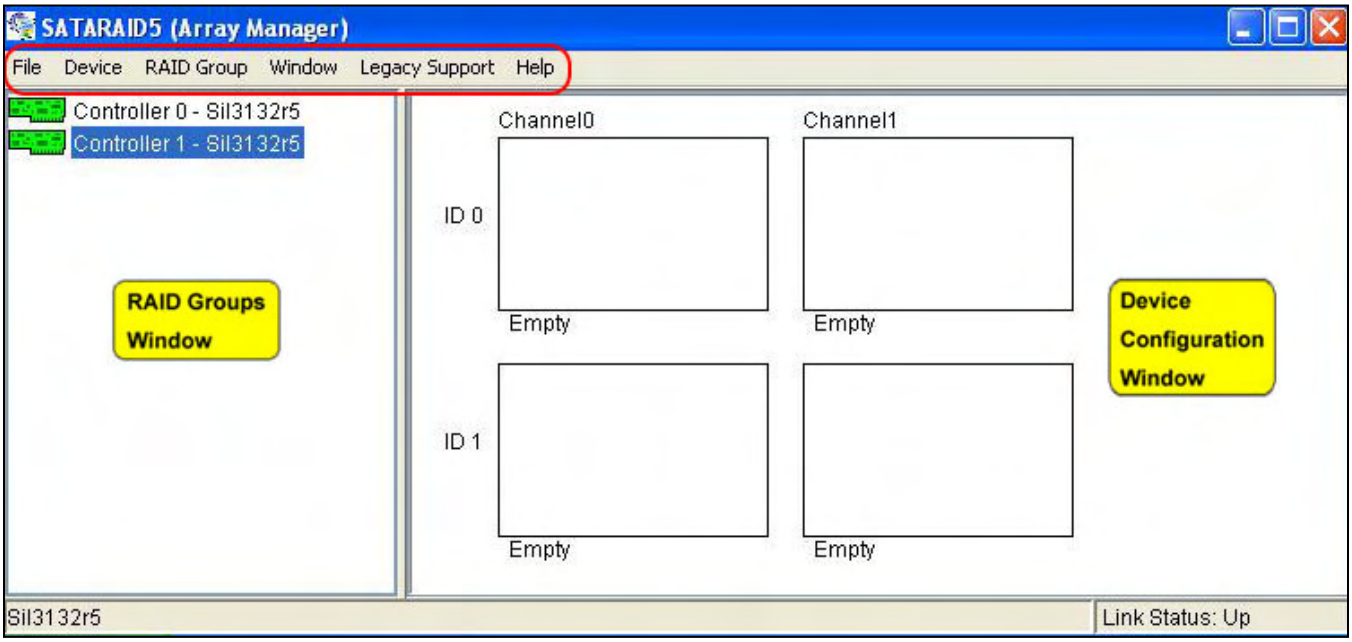
Before RAID Groups are created, the following options can be modified:

FIELD	DEFINITION
RAID Group Label	Enter an identifiable name for the RAID group. This value can be any string (up to 8 characters including blank spaces) to help users identify this volume.
RAID Group	Select a Group ID from the available ID list. The maximum number of RAID Groups per controller is 8. Group ID can be any number between 0 and 7.
Configuration	Select which RAID level is to be used to configure these members: • Contiguous (for virtual disk, JBOD Mode). • Concatenated (for multiple concatenated segments, Spanning Mode) • Striped (for RAID 0) • Mirrored (for RAID 1) • Mirrored Striped (for RAID 10) • Parity RAID (for RAID 5)
Capacity	Select a value to define the total usable capacity of the RAID Group or manually enter the volume size in gigabytes (GB). Selecting MAX will create the largest RAID set possible with the drive(s) selected.
Chunk Size	Select a value to define the chunk size (stripe size) for performance tuning. In general, large stripe sizes are best for large files that are accessed sequentially (for example, media streaming files) and smaller sizes are better for randomly accessed data like databases. This parameter is not used for Contiguous, Concatenated, and Mirrored configurations.
Rebuild Priority	Select a value to identify how quickly the controller should rebuild data on a disk after a hardware failure. A value of 1 is the lowest priority and will take the longest to rebuild. A value of 10 is the highest priority and will rebuild the fastest. Higher priority will require more CPU resources, which might affect the computer's overall performance. This parameter is not used for Contiguous (JBOD), Concatenated, and Striped configurations.
Check Pointing	Click the On or Off button to enable or disable the Check Pointing feature. When Check Pointing is enabled, restoring data is very fast after an unexpected power loss, although normal performance may be slightly reduced. When Check Pointing is disabled, normal performance is improved, but restores can take a long time to complete. This selection is only available when the selected RAID configuration is Mirrored, Mirrored Striped or Parity RAID, and the "Advanced RAID Features" checkbox in the Configuration/Advanced Options dialog is checked.
Parity (Return Dirty Data/Offline RAID GRP)	Select Return Dirty Data to return data after an unexpected power loss and all of the data could not be written to disk Select Offline RAID GRP to take the volume off-line. This selection is only available when the selected RAID configuration is Parity RAID and the "Advanced RAID Features" checkbox in the Configuration/Advanced Options dialog is checked.
Devices	Select the RAID member devices from the available device segment. Up to five members can be selected for Contiguous, Concatenated, Mirrored, Striped or Parity RAID modes. Exactly four members must be selected for Mirrored Striped mode.

RAID Level	Min # of Disks
0	2
1	2
5	3
10	4
Contiguous	1
Concatenated	1

Once all parameters have been selected, select "Create" to create the RAID Group. When finished, press Cancel to exit the Create RAID Group Dialog.

4.3 ADDITIONAL MENU FUNCTIONS



The Main menu are shown below:

File	**Device**	**RAID Group**	**Window**	**Legacy Support**	**Help**
Configuration	Create Spare	Create RAID Group	Task Manager	Create Legacy RAID Group	Help Topics
…			Event Log		About
Exit	Delete Spare	Rebuild RAID Group	Resources	Rebuild Legacy RAID Group	
	Delete Member	Delete RAID Group		Delete Legacy RAID Group	
	Delete Orphan	Bring RAID Group Online		Convert Legacy RAID Group	
	Make Pass-Thru	RAID Group Summary		Bring Legacy RAID Group Online	
	Device Summary			Create Legacy Spare	
				Delete Legacy Spare	
				Convert Legacy Spare	

The commands are documented on the pages that follow.

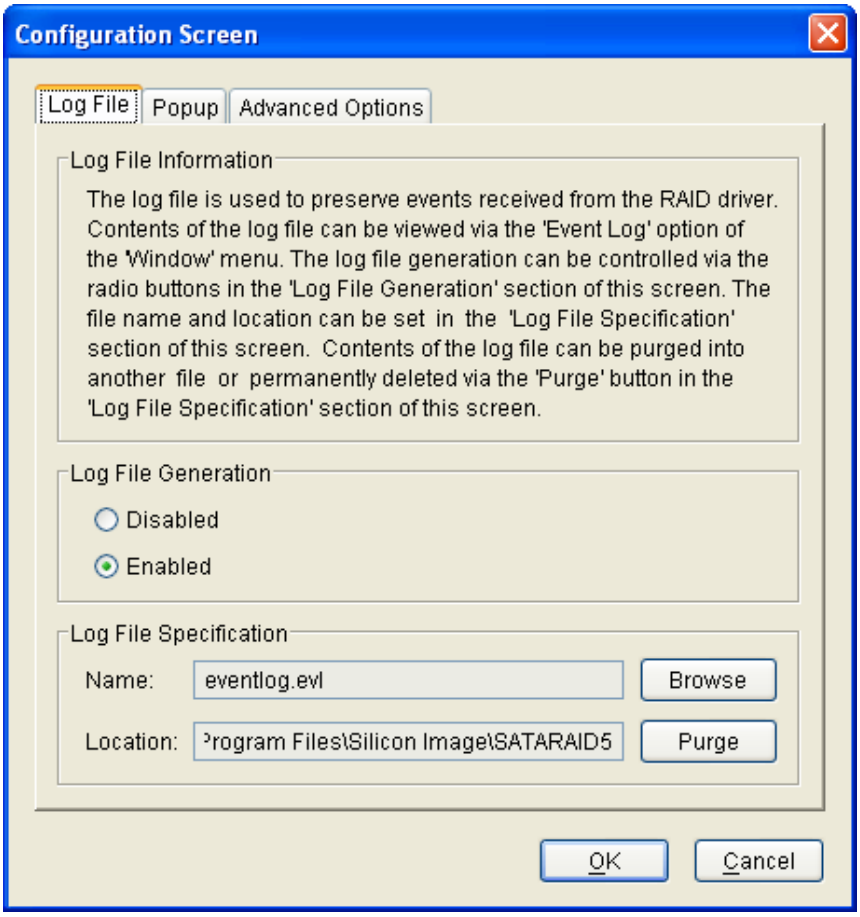
4.3.1 Configuration

SATARAID5 configuration options include customization of the settings for **Log File**, **Popup**, and **Advanced Options**. This command displays a dialog box to let user set different configurations for SATARAID5 with the following three tabs:

Log File Tab

The Log File tab allows you to define the location and name of the log file. The log file is used to store event information received from all Silicon Image RAID drivers. The log file is a text file and can be viewed with any text viewer (such as

"Notepad" on Windows platforms) or with the Event Log window of the SATARAID5 Manager. Use the Log File tab to set the location and the desired filename for the log file.

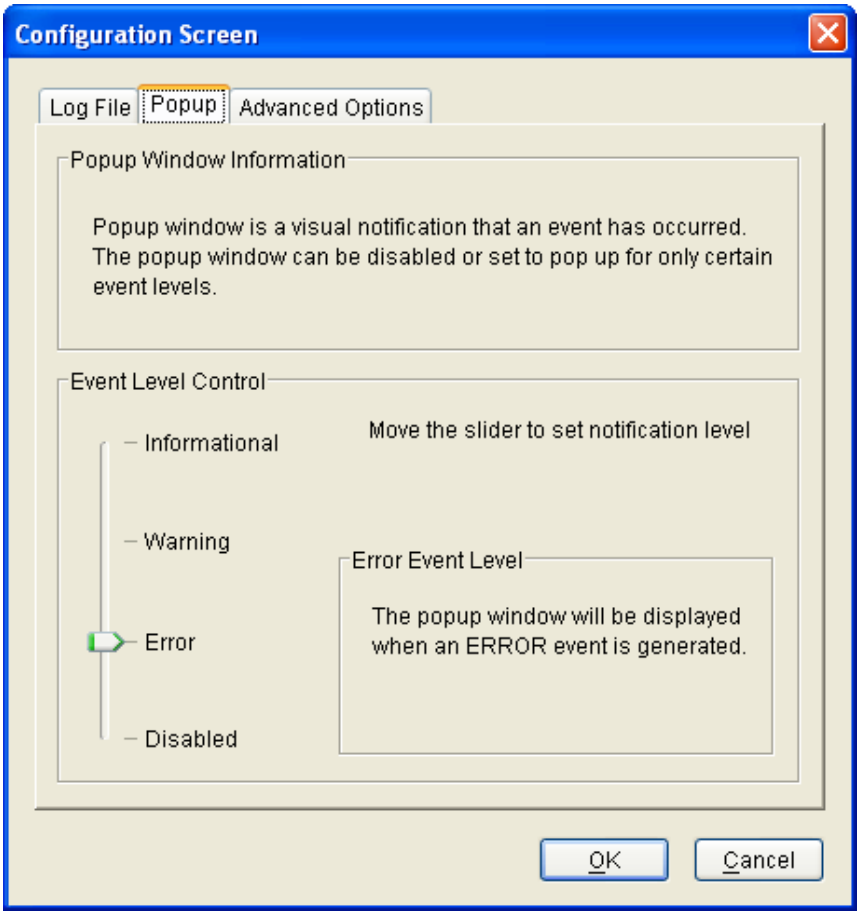


To specify whether the Log File is generated, click on either the **Disabled** or **Enabled** radio button. If Log File generation is enabled, you can click the **Browse** button to specify the file name and location of the Log File. You can also use the **Purge** button to delete the contents of the Log File.

Popup Tab

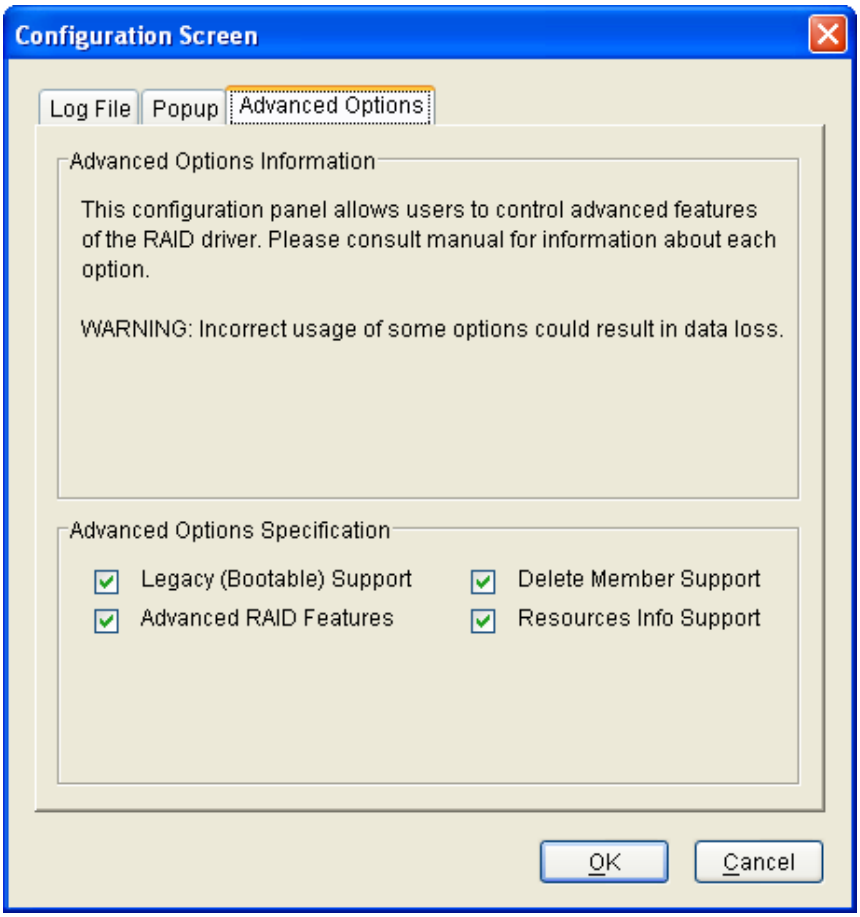
SATARAID5 can be configured to notify the user of events using messages in popup windows. Use the slider control to set the event level for popups to occur:

- Information Level - The following events will trigger a popup window:
  - Informational
  - Warnings
  - Errors
- Warning Level - The following events will trigger a popup window:
  - Warnings
  - Errors
- Error Level - The following events will trigger a popup window:
  - Errors
- Disable All - No events will trigger a popup window.



Advanced Options

The Advanced Options tab is used to control advanced features of the RAID driver. By default, all these advanced options are disabled.



The **Advanced Options** tab allows you to enable the following advanced features.

FEATURE	EXPLANATION
Legacy (Bootable) Support	When this feature is selected, Legacy Support menu will be available in the menu bar. Enables the Legacy Support menu to support RAID functions for legacy RAID groups (available on Windows platforms only). See Legacy Support menu options.
Delete Member Support	When this feature is selected, Delete Member menu item will be available under the Device menu. Enables the Delete Member option on the Device menu to delete a member from RAID 1 (Mirrored), RAID 5 (Parity RAID), and RAID 10 (Striped and Mirrored) groups. See Delete Member menu option.
Advanced RAID Features	When this feature is selected and user selects to create RAID group, if the RAID group to be created is fault tolerance group (RAID 1, RAID 5, or RAID 10), user will be able to select Improper Shutdown Policy in the Create RAID Group dialog box. Enables the selection of an Improper Shutdown Policy (including Check-Pointing and Dirty Parity handling) in the Create RAID Group dialog box when the selected RAID Group type is a fault-tolerant configuration (Mirrored, Mirrored/Striped and Parity RAID). This feature is not supported for Legacy RAID groups.
Resources Info Support	When this feature is selected, Resources menu item will be available under the Window menu. Enables the Resources option on the Window menu for debugging purposes. See Resources menu option.

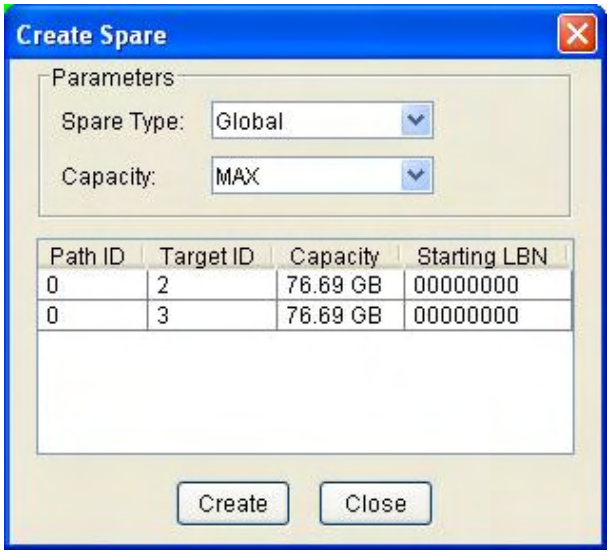
4.3.2 Exit

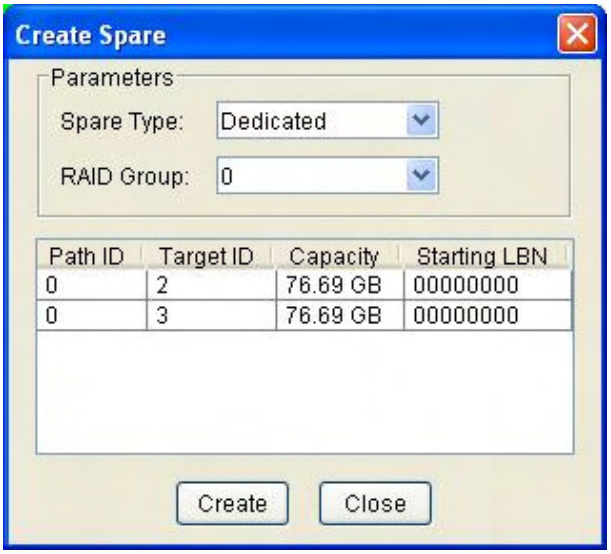
This command terminates the SATARAID5 program.

Create Spare

This command displays a dialog box to let user create spare drive, user needs to select the following parameters:

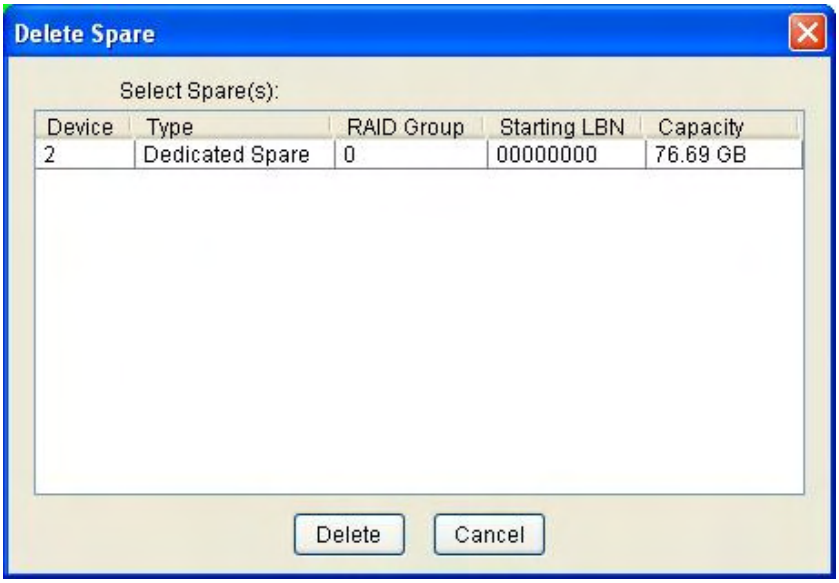
PARAMETER	DESCRIPTION
Spare Type	Choose one of: • Global - If the spare drive is for all RAID groups in the system. • Dedicated - If the spare drive is dedicated to the specified RAID group.
Capacity	If you select **Global** for the Spare Type, current options from a list of capacity are from 128 MB to 100 GB, HALF and MAX.
RAID Group	If you select **Dedicated** for the Spare Type, please selected RAID group to which this spare drive is dedicated.
Device Segment	Select one device segment from the available spare type only.





4.3.3 Delete Spare

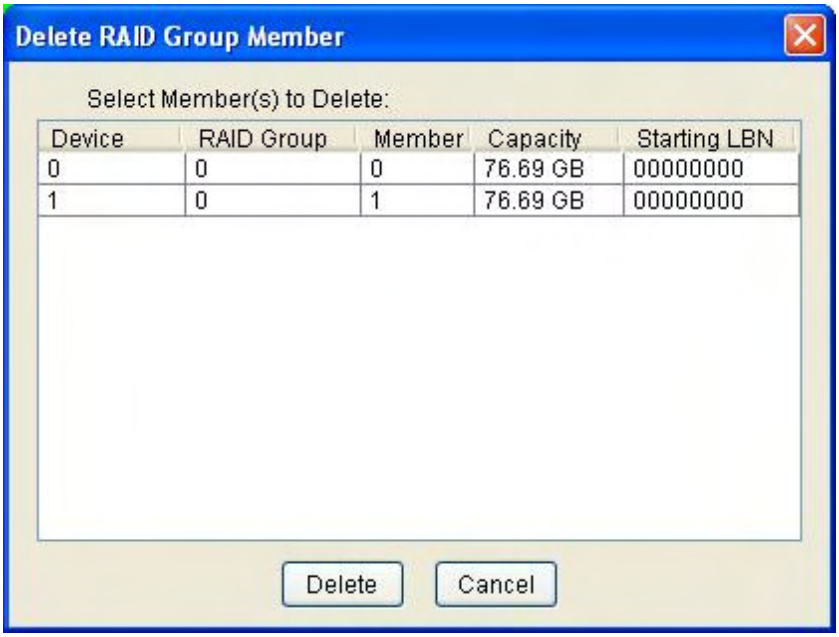
This menu option displays a dialog box to select (highlight) one or more spare drives to delete.



4.3.4 Delete Member

This menu option displays a dialog box to select (highlight) RAID group members to delete. Because RAID 0 is not fault tolerant, RAID 0 members are not shown in the list.

Note: Deleting members will demote the RAID group to a non-fault-tolerant RAID group.



4.3.5 Delete Orphan

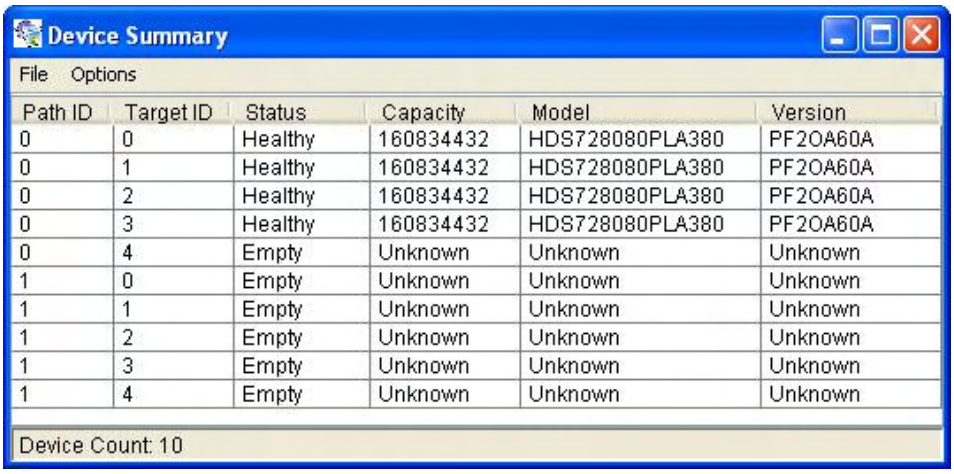
This menu option displays a dialog box to select (highlight) orphan segments to delete. An orphan segment is part of a RAID group that cannot access other segments within the same RAID group. When a member of a RAID group fails in a severe manner (such as a loss of power or a complete hard disk failure), it becomes an orphan.
This command displays the Delete Orphan Segment window to show all orphan segments and allow user to delete selected orphan segments.

4.3.6 Make Pass-Thru

This menu option is not available in this product.

4.3.7 Devide Summary

This command displays the Segment Summary window to show all physical devices' segments.



The Segment Summary window has its own menu bar. All options available via the menu bar are shown below

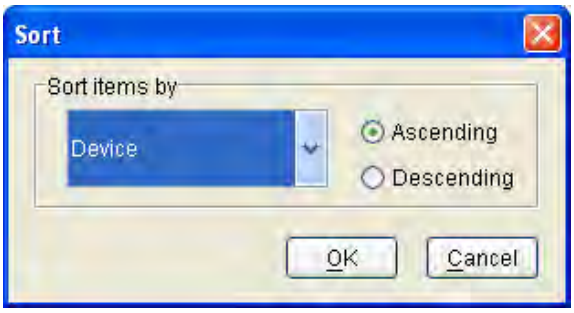
File	**Options**
Exit	Sorting…
	Fields…

Exit

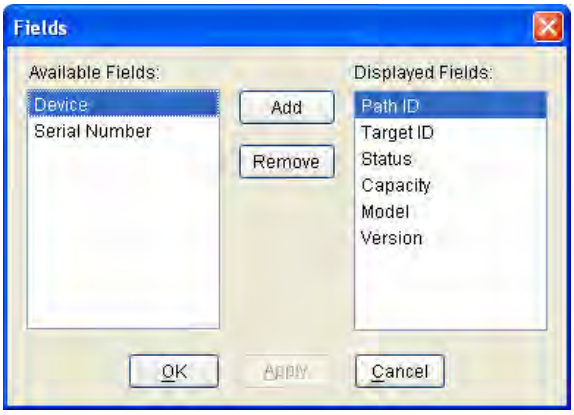
This command closes the Task Summary window.

Sorting

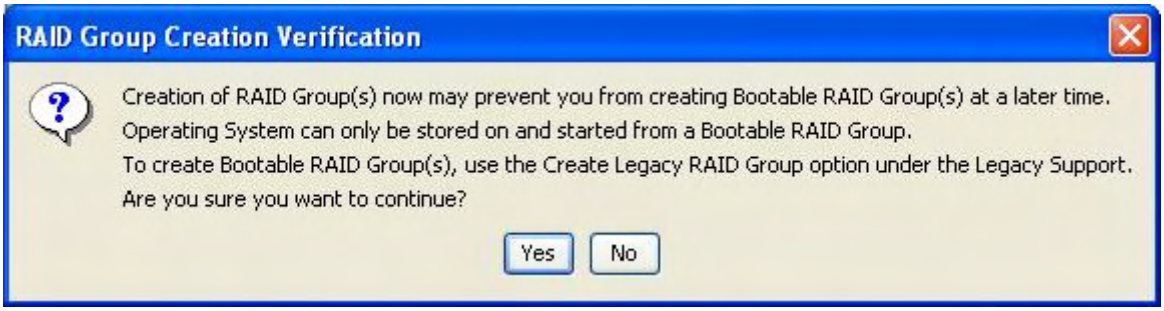
This command sorts the rows based on the selected field.

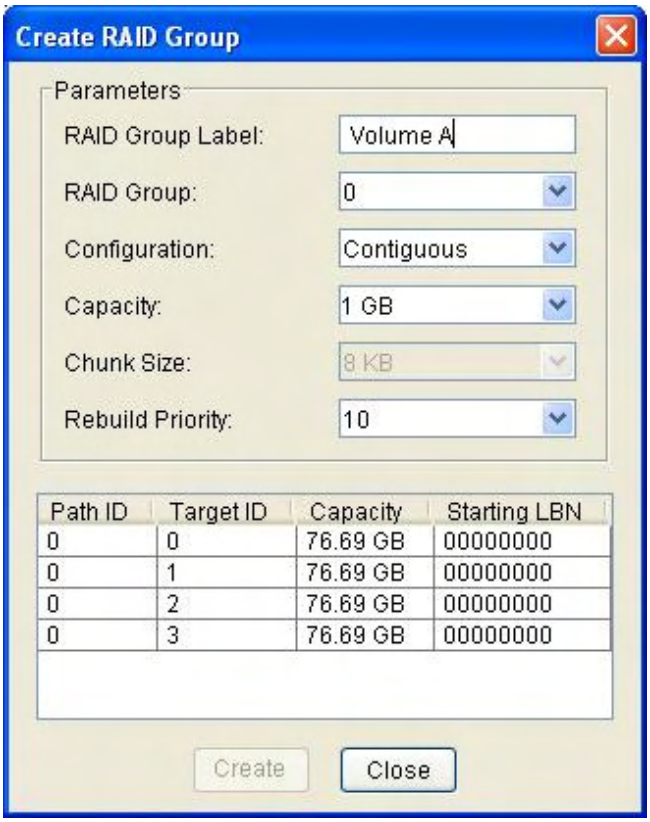


Fields
This command displays a dialog box to let user choose which fields will be shown in the Segment Summary window.



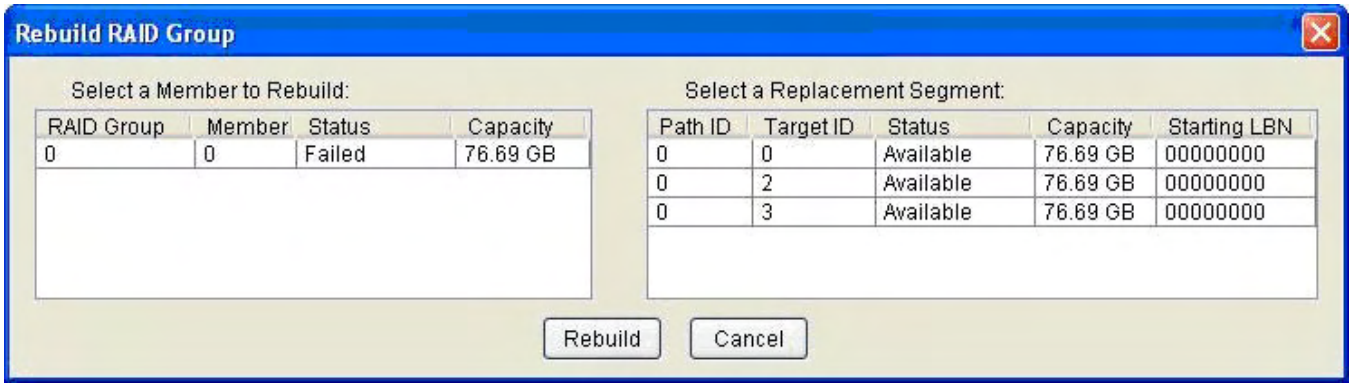
4.3.8 Create RAID Group
This command displays a dialog box to let user verify a raid type than display Create RAID Group dialog box.





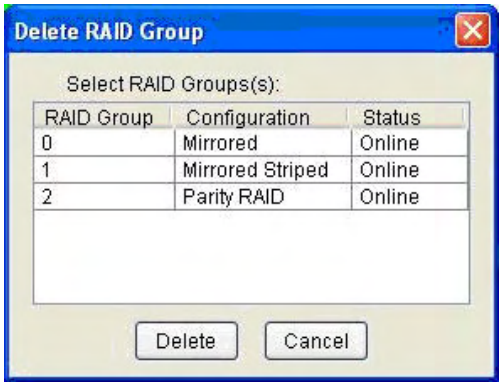
4.3.9 Rebuild RAId Group

This command displays a dialog box to let user choose a replacement segment to rebuild a non-fault tolerant RAID group.



4.3.10 Delete RAID Group

This command displays a dialog box to let user choose RAID groups to delete.



4.3.11 Bring RAID Group Online

This menu option is not available in this product.

4.3.12 RAID Group Summary

This command displays a dialog box to show all RAID groups' group ID, configuration, and status.

The RAID Group Summary window has its own menu bar. All options available via the menu bar are shown below.

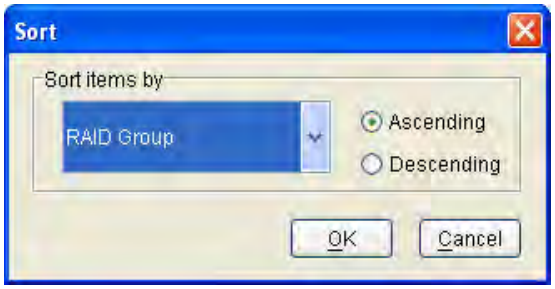
File	**Options**
Exit	Sorting…
	Fields…

Exit

This command closes the RAID Group Summary window.

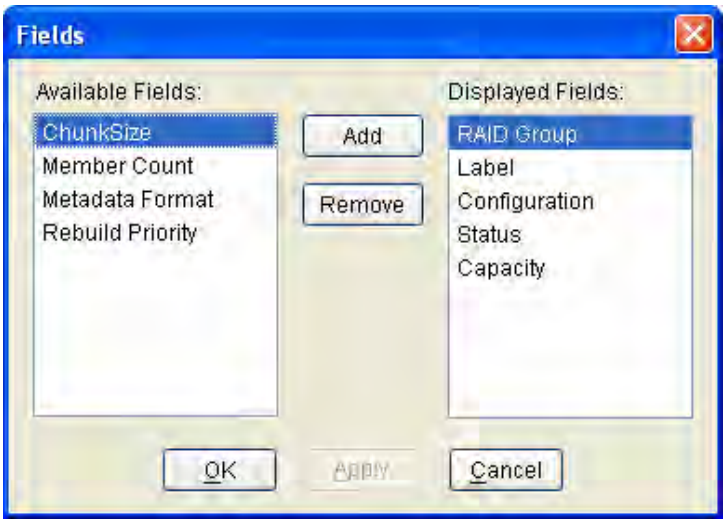
Sorting

This command displays a dialog box to let user choose up to 3 items to sort RAID group items in the RAID Group list.



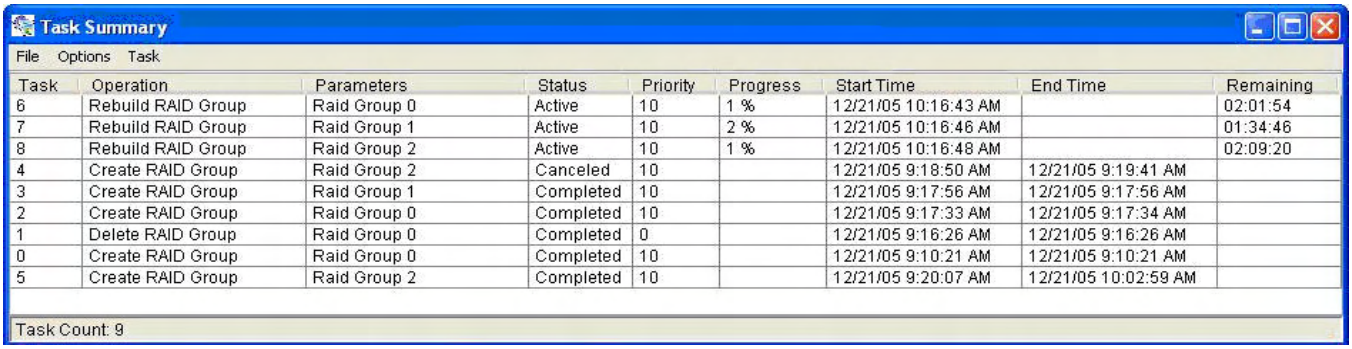
Fields

This command displays a dialog box to let user choose which fields will be shown in the RAID Group Summary window.



4.3.13 Task Manager

This command displays the Task Manager window. The Task Manager window lists all RAID and disk management tasks that have been started and/or done. This window provides user the ability to schedule any RAID and disk management operations including RAID group creation, rebuild, and test.



Task	Operation	Parameters	Status	Priority	Progress	Start Time	End Time	Remaining
6	Rebuild RAID Group	Raid Group 0	Active	10	1 %	12/21/05 10:16:43 AM		02:01:54
7	Rebuild RAID Group	Raid Group 1	Active	10	2 %	12/21/05 10:16:46 AM		01:34:46
8	Rebuild RAID Group	Raid Group 2	Active	10	1 %	12/21/05 10:16:48 AM		02:09:20
4	Create RAID Group	Raid Group 2	Canceled	10		12/21/05 9:18:50 AM	12/21/05 9:19:41 AM	
3	Create RAID Group	Raid Group 1	Completed	10		12/21/05 9:17:56 AM	12/21/05 9:17:56 AM	
2	Create RAID Group	Raid Group 0	Completed	10		12/21/05 9:17:33 AM	12/21/05 9:17:34 AM	
1	Delete RAID Group	Raid Group 0	Completed	0		12/21/05 9:16:26 AM	12/21/05 9:16:26 AM	
0	Create RAID Group	Raid Group 0	Completed	10		12/21/05 9:10:21 AM	12/21/05 9:10:21 AM	
5	Create RAID Group	Raid Group 2	Completed	10		12/21/05 9:20:07 AM	12/21/05 10:02:59 AM	

The Task Manager window has its own menu bar. All options available via the menu bar are shown below

File	**Options**	**Task**
Open…	Sorting…	Modify…
Save…	Fields…	Suspend…
Print…		Resume…
Exit		Cancel…
		Delete…

Open

This option will be available in future revisions.

Save

This option will be available in future revisions.

Print

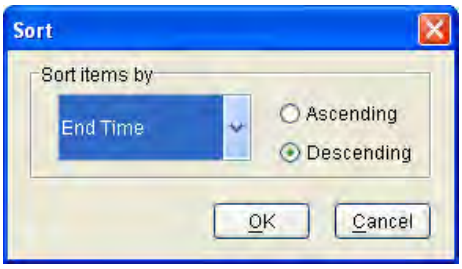
This option will be available in future revisions.

Exit

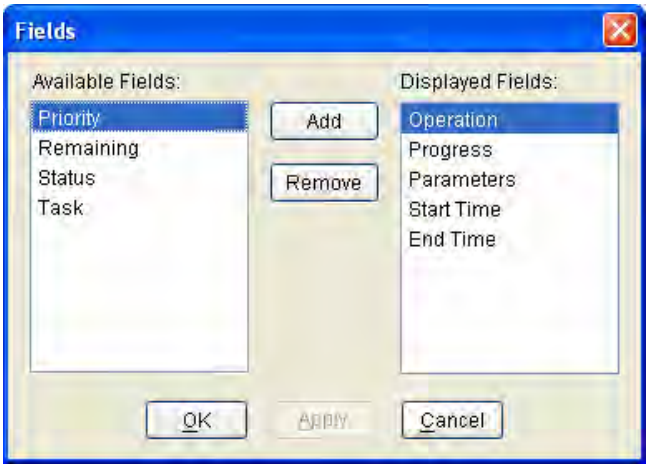
This command closes the Task Summary window.

Sorting

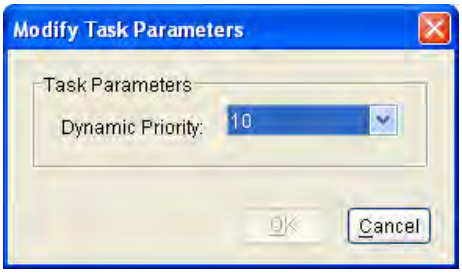
This command displays a dialog box to let user choose up to 3 items to sort task items in the task list.



Fields
This command displays a dialog box to let user choose which fields will be shown in the task list.

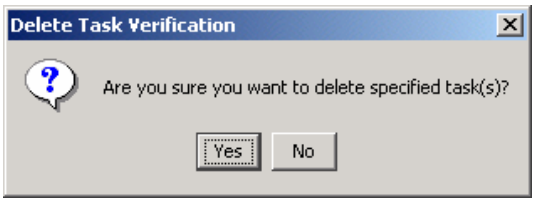


Modify
This command allows user to modify parameters of the selected task items. The following is an example of changing rebuild priority for a rebuild task.

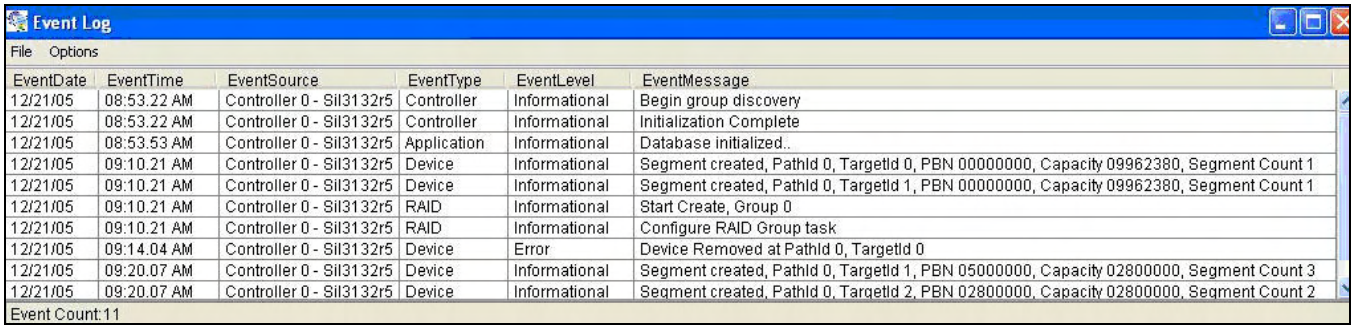


Suspend
This command allows user to suspend the selected task items.
Resume
This command allows user to resume the suspended task items.
Cancel
This command allows user to cancel the selected task items.

Delete
This command displays a dialog box to let user delete the selected task items from the task list in Task Summary window. The following dialog box will pop up to get confirmation from the user.



4.3.14 Event Log
This command displays the Event Log window. The Event Log window displays SATA device-related events that occur while SATARAID5 is running.

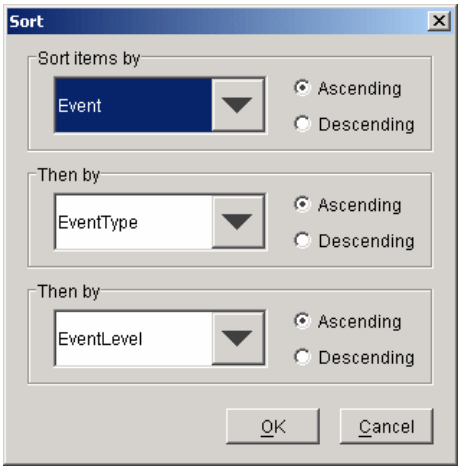


The Event Log window has it's own menu bar. All options available via the menu bar are shown below

File	**Options**
Exit	Sorting…
	Fields…

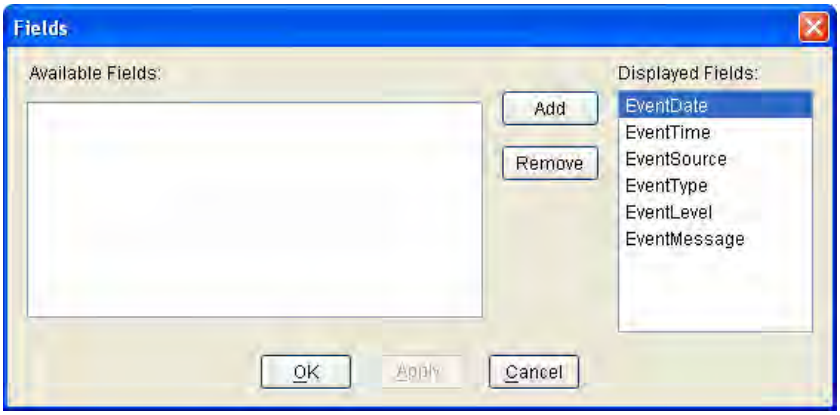
Exit
This command closes the Event Log window.

Sorting
This command displays a dialog box to let user choose up to 3 items to sort event items in the event log.



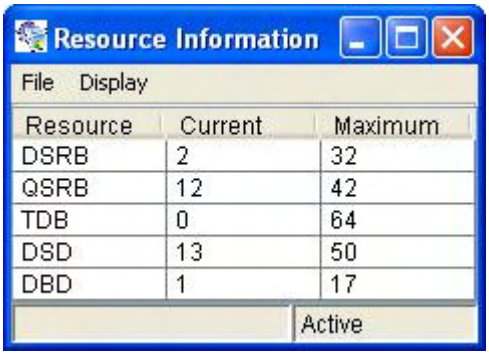
Fields

This command displays a dialog box to let user choose which fields will be shown in the event log.



4.3.15 Resources

This command displays the Resource Information window. This feature is for debugging purpose only.



The Event Log window has its own menu bar. All options available via the menu bar are shown below

File	**Display**
Exit	Suspend Alt+S
	Resume Alt+R

Exit

This command closes the Resources window.

Suspend

This command is to suspend the resources informantion.

Fields

This command is to resume the resources informantion.

4.3.16 Create Legacy RAId Group

This menu option is not available in this product.

4.3.17 Help Topics

This command opens an interactive help dialog using the standard Windows help interface.
This option will be available in future revisions.

4.3.18 About

This command displays a dialog box with more information about the SATARAID5 program, including the revision level.